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CONTENTS.

EDITORIALS:
Abusing the Electric Range..... 961
Are Public Service Commissions Worth While?..... 962
Simple Methods in Distribution-System Estimates..... 962
Transforming to Triple Frequency..... 963
Flat Rates for Tungsten Signs..... 963
DEPARTMENTS:
Commercial Practice..... 973
Electrical Construction..... 976
Dollar Wiring Kinks..... 982
Among the Supply Men..... 983
Legal Notes..... 984
Public Service Commissions..... 986
Questions and Answers..... 988
New Electrical and Mechanical Appliances..... 995
Latest Approved Fittings..... 999
Current Electrical News..... 1000
Record of Electrical Patents..... 1007
LEADING ARTICLES:
Electricity in Tanneries..... 967
Electric Signs.—By George E. Fuller..... 973
Fire-Alarm Systems.—III..... 976
Precautions to be Used with Respect to House-Moving.—By Maguire and Mooney..... 984
Oil-Burning Plant of Dunlap Electric Company..... 991
Conversion of Three-Phase into Single-Phase Current of Triple Frequency..... 992
MISCELLANEOUS:
The Quartz-Tube Mercury-Vapor Lamp..... 964
New Officers for Birmingham Association..... 964
American Institute Directors Meet..... 964
G. W. Pickard..... 965
Frank L. Dyer Resigns as Head of Thomas A. Edison Interests..... 965
Motor Car Club Launched..... 966
Colorado Electric Club..... 966
Advertising Electric Trucks by Illuminated Display Signs 975
Program Advertising for Central Stations..... 975
Among the Contractors..... 980
Method of Grounding on Bylesby Lines..... 981
A New System of Wiring..... 981
Electrical Supply Jobbers' Meeting..... 983
Telephone Pioneers Meet..... 990
Electrical Exports for September..... 992
Chicago Section of Electric Vehicle Association of America Discusses Co-operative Methods..... 993
Post-Office Lighting..... 993
National Association of Railway Commissioners Meets at Washington..... 994
Decision Upon Breach of Contract and Alleged Fraudulent Representation—Central Electric Company Wins Judgment..... 994

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ABUSING THE ELECTRIC RANGE.

Well designed and carefully built electrical apparatus for domestic service is noted everywhere for its ability to withstand hard conditions of operation, and some marvelous records have been made along this line within recent years. At the same time, it is important for central stations and others interested in the use of electricity in intensely practical spheres like the kitchen and the shop to see to it that equipment is not abused through the ignorance of the operator. Continuous, efficient and reliable service depend, somewhat unjustly perhaps, in the mind of the layman upon the performance of individual apparatus for which the energy-supply company may not be directly responsible, and for this reason the policy of assisting the consumer to get the best possible duty out of his equipment, even at some actual money cost to the central station, is one of the best ever inaugurated in the industry.

Perhaps no class of electrical equipment responds more quickly to decent treatment than heating apparatus, and what applies to the electric range is in a measure typical. Some of the abuses of a range of the latest type, which have tended to interfere with its best success, are well worth pointing out.

The range in question is equipped with a thermostat which cuts off the supply of current when the heat in the ovens has reached a temperature predetermined by the setting of a dial, the latter being graduated and used with reference to cooking requirements. The tendency of some operators is to set the dial hands at points beyond those indicated as necessary for stated kinds of cooking, with the result that energy is used extravagantly and the life of the heating elements shortened. Similar results follow the practice of leaving the current flowing in heaters on top of the stove when these are not in use. The practice of washing the heating elements in a bath of water instead of going over them with a damp cloth is also objectionable, and the neglect of the tops of heaters to the point where rust and dirt accumulate simply invites loss of heat through poor contact and consequent excessive consumption of energy for a given duty.

Other mistakes are the use of cooking utensils without flat bottoms, the placing of heat shields in ovens with the front sides at the rear, the plugging in of heaters of the wrong size at receptacles designed for different units, and the use of dishes in ovens which touch the sides and back, thereby cutting off the proper circulation of heated air.

ARE PUBLIC SERVICE COMMISSIONS WORTH WHILE?

The question is sometimes raised whether, admitting the advantages of regulation of public-utility corporations by commissions, the advantages are sufficient to justify the cost which such commissions entail to the respective states. The expense of maintaining such a commission can of course only be justified by the results which have been obtained. In cases where such commissions serve no further purpose than presenting lucrative positions to be filled by political favorites, where merely perfunctory duties are performed and no practical results obtained, one must admit that the expense is not justified. Again, even where the position of commissioner is filled by an earnest and active worker, if the provisions of the law creating the commission are such that the commission lacks power of effective accomplishment, it may again be questionable whether the effort is worth while, although in some cases the investigations carried on by such commissions may of themselves be of sufficient value to justify its creation. The above conditions have been illustrated in various states by railroad commissions which have existed for a good many years.

In most of the states where commission control has been extended to all public utility corporations the provisions of the law have been such as to give the commission the necessary power for accomplishing effective results and these are usually such that the expense of maintaining the commission is fully justified. Taking for example the Railroad Commission of Wisconsin, which is one of the most efficient and best administered among the states, the expense of this commission has been about $112,000. A large part of its work has been concerned with railroad rates and service. In addition to the enormous advantage which the people of the state have realized through reduction in freight and passenger fares, it is estimated that the cost of service by other public utilities has been reduced by about $300,000 a year. This reduction, however, is not entirely at the cost of the public utility corporations, which have also benefited in several ways. The expense of maintaining a lobby at the state capital to influence legislation has become unnecessary and useless, and similar expenditures to influence municipal councils in the granting and extensions of franchises have also been eliminated. Similar efforts to prevent the advent of a competitive company have also been made unnecessary and the specter of competition has disappeared except in those localities where it already existed before the jurisdiction of the commission was extended to cover these utilities. Moreover, the security of investments has been greatly increased and in many cases where an increase in rates was shown to be justifiable, the Commission has approved of such increase.

Experience in Madison shows that the saving to the people through reduced rates is often linked with direct advantages to the operating company as well. In this case the rate for electric service was reduced from 16 to 14 cents per kilowatt-hour, with the result that sales increased 16 per cent, and net earnings, 24 per cent. During the same period the investment was increased 22 per cent by new construction. Fifteen months after this went into effect the increase in business was so pronounced that the company accepted without protest a further reduction to 12 cents per kilowatt-hour.

It is sometimes feared that regulation will scare away capital and hamper future development. Where the investor is properly protected, this fear is not justified by experience. Thus in Wisconsin in 1910, the year after the central stations were placed under the jurisdiction of the Railroad Commission, the new construction amounted to more than 35 per cent in excess of the previous year.

Many similar examples might be cited to show that the reduction of rates is in many cases of advantage to the public-service corporation. Thus it was proved in Michigan that the enforced reduction of the passenger rate on one of the railroads to two cents per mile had actually resulted in increased net profits to the railroad company, due to increased travel.

Similar considerations of the work of the public service commissions in other states will show that the advantages both to investors in and customers of utility companies far outweigh the expense to the tax payers for the maintenance of such a commission. In states where no such commission yet exists with jurisdiction over electric corporations, the principal concern of the latter should not be to prevent the establishment of such a commission, but to see that it is clothed with the necessary powers and jurisdiction to properly fulfill its purpose and that the right kind of men are appointed upon it.

SIMPLE METHODS IN DISTRIBUTION-SYSTEM ESTIMATES.

In central-station practice it frequently becomes necessary to estimate the probable cost of a line extension, the installation of a given number of street lamps in a village previously without service, or the establishment of house services in a stated territory. The simple manner in which this problem was attacked by an experienced electrical engineer retained in a case of this kind illustrates the value of common sense even in dealing with technical matters. Instead of spending money for surveys of the territory, the proposed lines were plotted on the most reliable map of the town which could be procured; the lengths of circuit were measured by a small integrating roller familiar to draftsmen; poles were plotted with transformer locations at points of probable demand, and house feeds were figured on the average basis of 100 feet of wire per residence supplied from the line. The territory was driven over several times to make sure that no serious discrepancies existed between the map and the field itself, and the number of probable customers for the service was taken from a house-to-house canvass of the district, which included both dwellings and country business establish-

ments. These methods were used as the basis of estimates of new capital required, by permission of the state commission in regulative charge of the territory, with a 10-per-cent allowance for contingencies. The work was done in what is perhaps the most obvious way, but the size of the job did not warrant much field labor, and the fact that the simple methods used were taken as the basis of figures filed with the commission, clarified as they were by the judgment of the engineer called into the case, commends them to central-station men facing similar problems uncomplicated by city conditions.

TRANSFORMING TO TRIPLE FREQUENCY.

The problem of changing the frequency of an alternating current has not been generally regarded as a very important one. By means of a rotating frequency changer any desired transformation of this kind can be easily carried out. Moreover, the transformation of an alternating current to one of double frequency by means of a static transformer has been accomplished. In a recent publication, Prof. F. Spinelli presents a method for transforming three-phase current of a given frequency to single-phase current of the triple frequency. The method of accomplishing this is of so much interest that this article is abstracted on another page of this issue.

For satisfactory application to illuminating purposes, frequencies less than about 40 cycles per second are excluded. For electric railways, however, and for other motor work, as well as for transmission purposes, a lower frequency has advantages, and much of this work is being carried on at 25 cycles. Even lower frequencies are advocated by some and are in use in several installations in Europe. When lighting is done from the same source, however, it is necessary to use frequency changers or else make use of lamps containing three elements in a cluster, each of which is supplied by one phase of a three-phase circuit. The combined light from such a cluster avoids the flickering effect which is so plainly observable upon a low-frequency single-phase circuit.

By the use of the static transformer proposed by Professor Spinelli, it becomes possible to use three-phase current of low frequency for transmission and motor purposes, and to apply a higher frequency to lighting purposes without the use of any moving mechanism. The transformer utilized for this purpose suffices at the same time to reduce the voltage of the transmission line to that applicable to lamps. As the construction of such a transformer is not at all complicated and as it merely supplants a transformer which would otherwise be used for stepping down the voltage, it seems as if this might prove a very useful method of combining lighting applications with the use of low frequencies for motor purposes. Thus a frequency of 60 cycles might be retained for a lighting circuit, while the high-tension transmission line was operated at 20 cycles, as well as any railway circuits fed by it.

FLAT RATES FOR TUNGSTEN SIGNS.

In a paper, published in this issue, which was read before the recent convention of the Illinois State Electric Association, Mr. George E. Fuller interestingly presents some rather new aspects of the electric-sign situation. For instance, it is shown that the average monthly revenue to the central station from residences is $2, while the revenue from electric signs averages $13 per month. These figures are based on a flat rate for sign lighting, which the author considers the first principle in building up a successful sign business.

The success of the tungsten-filament sign lamp is assured. Unfortunately, however, numerous central stations have been reluctant to adopt the more efficient lamp because of their fear that their carbon-sign customers would notice the change and want tungsten lamps, thereby reducing the kilowatt-hour revenue of the company. Other central stations have concluded that inasmuch as the revenue from tungsten signs is cut in half, that decrease would make a difference between profit and loss on their books, and such signs are, therefore, not desirable.

It seems, therefore, that the flat-rate system is a logical method of charging for this service. Signs today are incidental to an advertising service and unless the central station is willing to provide adequate service the sign business is sure to react upon the company. A flat rate has usually involved only the turning on and off of the energy at specified hours. A flat rate with tungsten lamps should include lamp renewals, washing and painting of signs, etc.; all of which can be covered by an equitable rate per lamp per week that will prove very attractive even to the smallest customer. The average life of the tungsten sign lamp is in excess of 1,200 hours. Two complete installations per year will therefore furnish a very conservative basis for figuring a flat rate and the expense of one repainting will very well take care of another item to be included. Energy can be figured at a slightly higher rate than the previous meter rate, and when all these items are added together with a pro rata maintenance expense, the resultant figure will prove attractive to old customers as well as new, without reducing the income on the former basis.

It seems that such a rate would be well worth while on account of its effect on existing business alone. Every central station has been confronted with discontinuances because a sign has lost its novelty to the owner, or because he failed to make needed repairs and consequently injured the advertising value of the sign. These customers could largely be regained on the basis of furnishing advertising service. A simple flasher, color caps, or some little attraction that would give added advertising value to the sign when taken in connection with the service of renewing lamps, etc., would have a remarkable effect on the old business.

The Quartz-Tube Mercury-Vapor Lamp.

At the weekly luncheon and meeting of the Electric Club of Chicago held at the Hotel Sherman, Chicago, on November 14, Vice-President N. F. Abright presided, and introduced George C. Keech, illuminating engineer of the Cooper Hewitt Electric Company, who made an address on the construction, characteristics and use of the quartz-tube mercury-vapor lamp. Mr. Keech illustrated his talk by exhibiting one of these lamps and several of the quartz tubes, also a regular Cooper Hewitt lamp equipped with rhodamine reflector.

The use of a quartz tube instead of the ordinary lead-glass tube permits raising the mercury-arc temperature to 5,000 or even 6,000 degrees centigrade, thus improving the efficiency and allowing the use of a very short tube. These quartz tubes are very expensive on account of the difficulty of blowing them at the high temperature required; however, they have considerable scrap value even when they can no longer be repumped or patched. Abroad the quartz lamps have been used for street lighting for several years; in this country the patent situation has retarded development. The foreign lamps use radiators about the electrodes to keep the temperature from becoming excessive; in this country a condensing chamber is employed instead. The bare tube gives off considerable ultra-violet radiation which has been utilized for some purposes, such as sterilization. For ordinary purposes this radiation is injurious within 15 to 20 feet from the lamp; the use of a glass globe about the tube cuts off these ultra-violet rays.

Quartz lamps are made for direct current only and are connected directly across 110-volt or 220-volt circuits. The 110-volt lamp takes a current of 4 amperes and has 75 volts across the arc; the 220-volt lamp takes 3.5 amperes and has 150 volts across its arc. The mean lower hemispherical candlepower of the latter lamp is about 2,600 and its efficiency from 0.25 to 0.30 watt per hemispherical candlepower. The operating mechanism is simple, comprising only a tilting coil, dash pot, series resistance and inductance and a cutout.

At the Quarry Street generating station of the Commonwealth Edison Company, Chicago, six 220-volt quartz lamps have been used for about 16 months to illuminate an area of some 25,000 square feet; these lamps have totaled about 40,000 lamp-hours with about $100 total cost for maintenance.

Respecting the uses of the lamps, Mr. Keech said that they were suitable wherever a very powerful lamp could be mounted high, for instance, the lighting of important streets, and the general illumination of high buildings, steel mills, erecting shops, foundries, railroad train sheds, etc. They have also proved highly useful where their actinic rays can be utilized, as in bleaching, sterilization of water and milk, rapid testing of paints, photographic work, etc. In one European installation impure water was first filtered and then rendered completely innocuous, 500 cubic meters of water being treated by each lamp per day.

Mr. Keech briefly referred to the first street illumination with quartz lamps in this country, that of Randolph Street in Chicago, which was described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of September 7, 1912. He spoke of the advantages of high mounting of powerful lamps, these being the excellent uniformity of illumination and the relative absence of glare. The light from quartz lamps is less noticeably bluish green than that of the more common mercury-vapor lamps, because at the very high temperature of the arc yellow and red rays are also present in the spectrum. The high acuity of vision is not lessened, however.

The very recent development of a quartz lamp in which cadmium amalgum is used instead of pure mercury gives promise of improving the color value of these lamps still more without sacrificing their high efficiency.

In reply to numerous questions, Mr. Keech stated that the useful life of the quartz tubes, aside from breakage due to carelessness in handling, is terminated usually by loss of vacuum; this can be remedied by re-exhaustion. The average life is about 3,400 hours, although many tubes have been in service over 8,000 hours. The efficiency is very well maintained throughout the life of the tube. The 220-volt lamp is more efficient than the 110-volt lamp.

Homer E. Niesz spoke of the successful substitution of three quartz lamps for six carbon arcs and 36 incandescents in the power house of the Cosmopolitan Electric Company, Chicago. This had resulted in reducing the connected load for lighting the station from 9,600 to 2,600 watts, a saving of 7 kilowatts.

New Officers for Birmingham Association.

At the annual meeting of the Birmingham Association of Electrical Engineers held on November 11 at Birmingham, Ala., the following officers were elected for the year 1913:

President, Fred V. Underwood, superintendent of the Electric Light Department of the Birmingham Railway, Light & Power Company.

Vice-president, D. J. Gaboury, chief electrical engineer of the Woodward Iron Company.

Secretary and treasurer, W. H. Fleming, of H. W. Johns-Manville Company.

During the past year there has been an increase in the membership of this association, and it now has on its rolls many of the leading electrical engineers of the South.

American Institute Directors Meet.

At a meeting of the Board of Directors of the American Institute of Electrical Engineers in New York City on November 8, authority was granted to organize an Institute branch at the Clemson Agricultural College, Clemson College, S. C.

The president was authorized to appoint a Committee on the Use of Electricity in Mines, similar in scope to the other technical committees of the Institute.

Resolutions addressed to Congress were adopted urging suspension of action on all patent bills now pending and the appointment of a commission made up of unbiased, independent, non-partisan men of national standing to investigate the American patent situation and recommend action to Congress.

A resolution was also adopted, based upon recommendations by the Public Policy Committee regarding bills relating to the regulation of water powers, that when the question at issue is one purely of engineering the Board of Directors would approve the appointment by the president of a committee or delegation to confer with the Congressional Committee before which the bill is pending.

One member and 33 associates were elected and 125 students were enrolled.

The midwinter convention of the Institute is to be held in New York City, February 26 to 28, 1913, under the auspices of the Standards Committee.

At the midwinter convention especial attention will be devoted to the following subjects:

(1) Methods of determining temperature of apparatus and room, and correction of temperature rise for room temperature, humidity, etc.

(2) Methods of determining losses in apparatus, especially load losses and commutation or brush losses.

(3) Method of testing apparatus under conditions equivalent to specified performance.

(4) Guarantees and permissible variations therefrom.

(5) Miscellaneous rating and testing subjects, such as insulation and high-potential tests, permissible variation of wave shape of alternators, control apparatus, heating devices, etc.

G. W. Pickard.

While there is not today the spectacular interest accorded to wireless that obtained a few years ago when the accomplishments of the many inventors devoted to this phase of electrical development were heralded far and near, hardly a day passes without some new feature of design in equipment being put into successful operation. Prominent among those who have contributed very greatly to the advancement of the art and science of radio telegraphy is the subject of this sketch, Greenleaf Whittier Pickard.

Mr. Pickard was born February 14, 1877, in Portland, Me. He attended the public schools there and was a student at the Westbrook Seminary, Woodfords, Me.; the Lawrence Scientific School, Harvard University, and the Massachusetts Institute of Technology.

Mr. Pickard took up the study of wireless in 1899, and was placed in charge, under the direction of A. L. Rotch, at the Blue Hill Observatory, Milton, Mass., of experimental work in wireless telegraphy for the Smithsonian Institution. This study was devoted in particular to the investigation of the characteristics of very high antennas.

In June, 1901, Mr. Pickard became associate engineer of the American Wireless Telephone & Telegraph Company, of Philadelphia, Pa. Later he was made chief engineer of the Federal Wireless Telephone & Telegraph Company, of Philadelphia. He was in full charge of the designing of a number of complete wireless-telegraph plants, including stations at Baltimore, Md., Washington, D. C., and Galilee, N. J. He joined the engineering staff of the American Telephone & Telegraph Company at Boston, Mass., in July, 1902, when he took entire charge of the investigation of wireless telephony. At this time he developed an original system of wireless telephony that was given a very successful demonstration in September, 1902. He was also in charge of the development of a system and apparatus for the protection of telephone circuits from lightning and high-tension circuits, and a system and apparatus for simultaneous telegraphy and telephony over telegraph wires. He also completed studies bearing upon high-frequency oscillations and electric-wave propagation, wireless detectors, telephone relays or repeaters, improvements in telephone receivers and in the measurement of feeble alternating and oscillatory currents. He was also the company's chief expert in cases involving the handling of wireless-telegraph patents. Mr. Pickard became consulting and electrical engineer of the Huff Electrostatic Separation Company, of Boston, in June, 1906. At this time he was also connected with the Wireless Specialty Apparatus Company, of New York, and he is now vice-president and general manager of this company with headquarters at Boston, Mass.

At about this time Mr. Pickard brought into practical use a number of developments, of which he is the sole inventor. Among these were a simple method of measuring the sensitiveness of wireless detectors; a method of measuring the received energy at wireless stations, which for the first time permitted of measurements in absolute units of the received energy in long-distance wireless communication; an investigation of solid rectifiers and their adaptation to wireless communication; a method of receiving wireless signals by the use of an underground closed loop of wire, which has permitted the determination of the direction and absolute intensity of the magnetic component of electrical waves, and also enabled important investigations to be made as to the structure of these waves at great distances from their sources. This form of receiving circuit was applied later on by Bellini and Tosi in their radiogoniometer. One of the most important inventions for practical use in wireless contributed by Mr. Pickard is the solid rectifier. One form of this, the "Perikon detector," is standard for the United States Navy, and was instrumental in establishing the long-distance records made in wireless.

Greenleaf W. Pickard,
Wireless Engineer and Inventor.

Mr. Pickard has been a prolific contributor to the proceedings of scientific societies, and has contributed many articles to the technical press. His name is familiar to all readers of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, and his fame is universal for his happy style of clear and lucid enunciation and exposition of this difficult subject. Mr. Pickard has been granted over 40 United States and foreign patents upon wireless apparatus. His home is at Amesbury, Mass., where he has a complete wireless station and laboratory devoted to research and development work. He is a member of the American Institute of Electrical Engineers, the Society of Chemical Industry, London, and of the Wireless Institute of New York.

Frank L. Dyer Resigns as Head of Thomas A. Edison Interests.

Announcement has been made that Frank L. Dyer, for ten years prominently identified with the interests surrounding the inventions and manufacturing developments of Thomas A. Edison as president of the Edison Company and allied interests, has resigned. Mr. Dyer besides being president of the principal Edison companies was also the chief legal advisor. He was president or director of 19 different corporations. How many of these corporations his resignation affects is not known. While Mr. Edison has always taken a very keen interest in all of the organizations built up around his inventions, and has retained financial control of many of these corporations, he has always permitted others to conduct the business developments. In connection with Mr. Dyer's resignation it is understood that Mr. Edison intends to become the active head of these organizations, and this, of course, is a matter of momentous concern. The Edison interests embrace large organizations in England, France, Germany, Spain and Mexico, besides the many companies in this country.

Ground has been broken for the north wing of the new electrical laboratory of the Sheffield Scientific School, at Yale University, New Haven, Conn.

Motor Car Club Launched.

Dealers in electric automobiles and trucks in Boston, and men engaged in allied interests, have completed the organization of the association in that city which will henceforth be known as the Electric Motor Car Club of Boston. The organization has hitherto been the Electric Vehicle Club, and for several years was under the patronage of the Edison Electric Illuminating Company, whose guests the members were at a weekly luncheon held throughout the year at the Edison Building.

The final steps in forming a new club, which shall be self-supporting, were taken on the evening of November 14, at a dinner at Hotel Marliave, Boston.

President Day Baker presided, and the committee on reorganization, Frank J. Stone, chairman, together with the executive committee, presented a constitution, which was adopted with few amendments. Discussion centered on the name for the organization. It was urged by some that the word vehicle, formerly employed, savored of the slow-speed cars of the early days of the industry. It was suggested that the club be called the Electric Automobile Club, but this name was objected to on the ground that it implied pleasure cars exclusively. The name finally adopted was acceptable to 14 of the 21 members voting.

Membership and fees were defined as follows: Class A, those deriving an income from the sale of electric automobiles and accessories, for whom the fee is $10 per year; additional members of the same firm, $3.00. Class B, owners and operators of electric cars, for whom the fee is $2.00. Class C, representatives of trade and technical journals and daily newspapers, on whom no membership fee is levied. All members to have voting privilege.

The annual meeting is set for the second Wednesday in October of each year. Organization was perfected by the enrollment of those present as members and the election of officers, as stated in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of November 2.

E. S. Mansfield called the club's attention to an appeal that is being circulated by the Massachusetts Society for the Prevention of Cruelty to Animals, which urges Christmas shoppers to carry purchases home themselves rather than burden the overworked horses employed by some stores in delivery service. Mr. Mansfield corrected a current report that the Edison Company loans rectifiers to private garages, stating that the company is loaning only to public garages, in exceptional cases.

He stated that the company offers to take a photograph of every new electric truck bearing its proper business lettering, introduced into its territory and present it to the agent who made the sale.

P. E. Whiting, of the Cambridge Electric Light Company, announced that a charging plant is about to be opened in Cambridge near the University Press, with a capacity of six cars.

W. H. Atkins, general superintendent of the Boston Edison Company, referred to the desirability of having one of the course of lectures, which is given during the winter by advertising experts and lecturers of the company, before lodges, churches, etc., on the general subject of energy-consuming devices, relate to the use and advantages of electric vehicles.

John A. Voodry, a Boston insurance expert, delivered an address on "Salesmanship." His advice to electric automobile agents, whom he congratulated on being engaged in one of the greatest industries of the day, was: Gain the full confidence of your prospective customers; be clear in telling him all the features of your cars; know your man before you approach him; don't "knock" your competitor; approach your prospect only when he is at leisure and in a receptive mood; talk only when you are full of your subject, otherwise stay away; make your first impression a telling one; it is the first impression which determines success or failure in making a sale.

F. D. Stidham, publisher of the New England Auto List, asked for information from which he proposes to compile a complete list of charging stations in New England. He urged the making of electric pleasure cars more individual in style and design.

President Baker called attention to the unreasonable restrictions imposed on parking cars in Boston streets, which apply as rigorously to residence as to business streets. He urged that pressure be brought to bear on the authorities with a view to extending the time allowed for cars to stand. The advisory committee was directed to confer with other motor associations, and it was proposed to address a petition to the City Government asking for relief.

Chemical Engineers to Meet in Detroit.

The fifth annual meeting of the American Institute of Chemical Engineers will be held on December 4 to 7. Headquarters will be at the Hotel Cadillac, in Detroit, Mich., and sessions will be held there on Wednesday morning, December 4, Wednesday evening and Friday evening. On Friday afternoon there will be a session at the University of Michigan, Ann Arbor, Mich. A subscription dinner will be held on Thursday evening at the Hotel Cadillac. A large number of excursions to industrial plants have been arranged.

Colorado Electric Club.

At the luncheon of the Colorado Electric Club, held at the Albany Hotel on November 14, James J. Callbreath, secretary of the American Mining Congress, was the speaker. The topic was: "How to Keep the Mining Congress in Colorado." Mr. Callbreath stated that Colorado was known as the mining state and that every one knew that electric current was the proper power for mines and he prevailed upon all to put their shoulders to the wheel and help to keep the Congress headquarters in this state, as California, Oregon, Washington and Utah were making strenuous efforts to secure it. He stated that eventually the Government would build a structure for offices and museum and that Denver should have that building.

The Electric Club is campaigning for new members and during the last three weeks ten new ones have been added. It is out after a membership of 1,000 for 1913.

Consolidated Rally.

About five hundred men engaged in the service of supplying electricity to the City of Baltimore, attended a rally arranged by the Consolidated Gas, Electric Light and Power Company of that city, at the Industrial Building, on November 13. Following the meeting, at which numerous speeches were made by those in charge of departments, a theatrical performance was given by the members of the organization. Later supper was served. These rallies are quite frequently given by the Consolidated Gas, Electric Light and Power Company, and are designed to bring the organization into closer contact, with the view of promoting its efficiency.

Baltimore Section Elects Officers.

The annual election of officers of the Baltimore Consolidated Section, National Electric Light Association, for the ensuing year, took place at the Johns Hopkins University. The following officers were elected: J. T. Kelley, Jr., president; L. L. Heyden, vice-president; D. C. Bruce, secretary; R. F. Bonsall, treasurer. The Executive Committee consists of R. H. Tillman, E. W. Bull, E. D. Edmonston, H. Schmidt, Jr., R. C. Niles, Jr., and W. P. Beyerle. After the election a buffet luncheon was served.

Electricity in Tanneries.

The diversity-factor in the operation of tanneries offsets, to a large degree, the value that would exist in the use of exhaust steam for heating purposes, and this condition, together with the actual saving in energy required to do the work, makes central-station service very successful for this industry. Operating results substantiating this are given in the data sheets.

The United States Census for 1909 reported 951 tanneries engaged in the manufacture of leather, the total production being more than 142,700,000 hides and skins. This is an increase of 10 per cent over the number of establishments engaged in business in 1904, while the figures for 1913, it is estimated, will exceed those of 1909 by 13 per cent. While, until recently comparatively few of these tanneries were completely electrified a large number had installed partial equipments to meet the requirements for additional capacity. Today the plants that had installed partial electrical equipments are entirely discarding their old steam equipments, while increasing numbers of completely steam-driven plants are installing motor drive throughout.

Group of Staking Machines Driven by Motor in J. Greenebaum Tannery, Chicago.

In general the application of electric motors to the driving of tannery machinery offers the same advantages as in other industries with the distinctly important features of decreased power cosumption and increased production for a given equipment.

Owing to the extended areas over which power must be transmitted the losses incurred in steam-driven plants due to friction and belt transmission frequently constitute from 35 to 70 per cent of the total energy consumed. In addition to this loss several engines and isolated boiler equipments are usually necessary with high cost for attendance and maintenance. The major portion of this power cost may be eliminated by the application of the motive power direct to the various machines. The cost of energy in a plant operated in this manner becomes proportional to the work done.

Existing installations of electric motors for tanning machinery have already proved that a given equipment will do more work when electrically driven, due mainly to the greater uniformity of speed attained and to improved control. Other advantages which indirectly affect the cost and quality of the product are: Greater cleanliness, materially reducing the percentage of damaged leather in the final process of finishing; most convenient and logical arrangement of machines, insuring the handling of the hides from one machine to another quickly and economically; reliability of operation since failure of any driving motor can affect only a small part of the plant machinery. This latter

factor is of vital importance in tanneries since the failure of power at certain stages of the process will frequently entail a heavy loss.

The foregoing advantages of electric motor drive are only a few of the innumerable points that specifically apply to tanneries. They alone are, however, of sufficient importance to justify the complete electrification of steam-driven establishments. The question of central-station or isolated-plant supply is not so easily disposed of, as washing, tanning and dyeing operations require large quantities of steam and hot water and for this reason manufacturers are sometimes reluctant to purchase power, usually because of an erroneous idea as to actual steam or private-plant operating conditions. In the great majority of plants a careful investigation will show that operating costs can be materially reduced by taking energy from the local central station as both investment and cost of maintenance are greatly reduced. A small low-pressure boiler can economically fulfill all heating requirements.

Selection of Motors.

On account of the presence of large quantities of moisture, steam and acids or strong alkalis, the motors for driving tannery machinery must be exceptionally well insulated to insure uninterrupted service. The squirrel-cage type of induction motor combines features of simplicity and durability which enable it to withstand the most adverse conditions.

A larger part of existing installations of electric motors in tanneries are arranged for group drive on account of the intermittent power requirements of many of the machines used. This feature is especially notable on the heavy staking, rolling and glazing machines having reciprocating motion with the load applied only during a portion of the stroke. One of the accompanying illustrations taken in the tannery of J. Greenebaum, Chicago, shows a typical arrangement of a group of staking machines.

Two Shaving Machines Driven by 7.5-Horsepower Motor.

On the other hand, machines requiring power for longer periods or high-speed apparatus can well be driven by individual motors. The clumsy and expensive belt-shifting device can be replaced by the electric switch con-

Splitting Machine, Greenebaum Tannery.

Motor-Driven Drums, Greenebaum Tannery.

veniently arranged for control by the operator. Additional machines may be installed without interfering with the operation of those in service and with no additional outlay except for motors and installation. Overtime work can also be economically provided for either in large or small quantity, the power requirements being directly proportional to the work done.

The accompanying table gives the horsepower requirements of a few of the machines used in a tannery.

Fifty-Horsepower Motor Driving Machines in Greenebaum Tannery.

In addition to these machines a large number of pumps is necessary in tanning establishments for transferring water and tanning liquors. These pumps when electrically operated may be direct-connected to the driving motor and started or stopped by throwing the controlling switch. It is also possible to place the pump in the most convenient location regardless of the source of power.

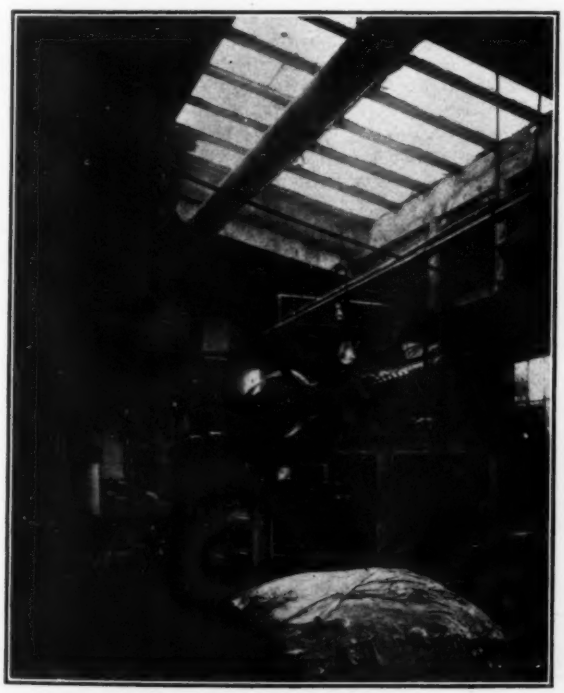
Several fans are also usually employed to expedite the drying of the hides or skins between the various operations of tanning, washing and dyeing and these are also most satisfactorily driven by direct-connected motors.

Machine.	Horsepower.
Fleshing machine (Vaughn No. 5)	15
Bark cutter	25
Squeezer	3
Unhairing machine (Whitney Jumbo)	5
Finishing machine (Vaughn No. 3)	2
Splitting machine (Vaughn 57-inch)	3
Tanning or stuffing machine	5
Measuring machine	2
Whitening machine (Vaughn No. 3)	7.5
Wash mill	10
Dry mill	5
Staking machine	5
Reels	2 to 5

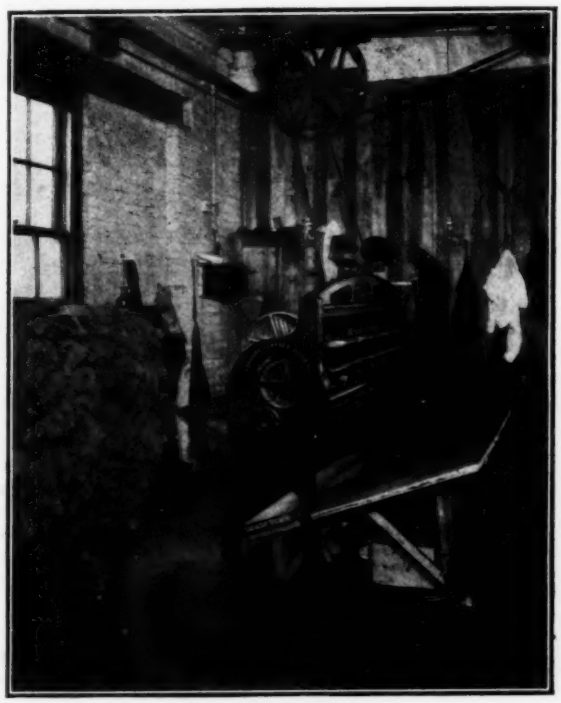
Typical Installations.

Conditions as found in the typical tannery are well illustrated in the following description of a large motor-driven plant, located in Wisconsin, producing principally harness and sole leather.

Preparing the tanning liquor is the fundamental process in tanning. The bark mill and leach house in which this operation is carried on at the tannery in question is equipped throughout for electric drive. Bark entering the bark mill is passed through two Ott mills, where it is ground and then conveyed, by means of a double-chain conveyor from the mill-room to the leach house. These two mills, which are operated



Motor-Driven Unhairing Machine.



Motor-Driven Measuring Machine.

by a 125-horsepower motor, supply twenty 14 by 16-foot leaches. The conveyor, operated by a 15-horsepower motor, on its return trip, carries the spent tan from these leaches to an elevator that in turn conveys the spent tan to the boiler house. This latter conveyor is operated by a 10-horsepower motor.

In leach pitching the utilization of electricity has permitted a remarkable saving in shafting, cost of other mechanical equipment and reduced the operating cost.

There is also installed in the leach house a motor-driven air compressor for supplying compressed air for handling the tan liquor. The motor driving this compressor is of 20-horsepower size.

In tanning harness leather the first process, after soaking the hide in a lime solution, is to remove the hair and any particles of flesh which may still be present. These operations are carried on in a building known as the beam house, in which is installed an unhairing machine, driven by a 10-horsepower motor, a wash and bate wheel, driven by a 15-horsepower motor, and a lime reel, driven by a 15-horsepower motor. The hides after passing through the unhairing machine are placed in the wash and bate wheel where they are thoroughly washed. To guard against any lime remaining in the hide, they are then passed through the motor-driven lime reels. In the beam house some conception of the work done may be gained from the unhairing machine which unhairs over 450 hides daily. For drying the hides after they pass through the beam house operations, there is installed a ventilating fan operated by a five-horsepower motor.

Leaving the beam house the hides pass through the tan yard where they are again washed by means of a wash wheel driven by a five-horsepower motor.

After leaving the tanning vats, where they are next placed, the hides are taken to the shaving department where they are trimmed and then scoured. The equipment of this department comprises two shaving machines, each operated by a 20-horsepower motor, and a scouring machine, also driven by a 20-horsepower motor. The 50-horsepower motor for operating the elevator of the building is also installed in this department.

From this department the hides are taken to the stuffing room where they are treated with grease and then dried. In operating machinery for stuffing leather tanners recognize the necessity of uniform speed because of the uniform pressure required. The stuffing mill in this tannery is motor-driven, a 50-horsepower motor being employed. For drying the hides after passing through the stuffing mill a motor-operated fan is employed. This fan is driven by a 10-horsepower motor and operates continuously day and night.

The next operation in preparing the tanned hide for the market, in which electrically operated machines are used, takes place on the setting floor. The hides after leaving the stuffing room are passed through setting machines to smooth the surface and fill any porous places in the hide. Three setting machines are installed in the tannery, a 20-horsepower motor driving a line shaft to which the machines are belted. Following this operation the hides are again dried, air being furnished by a 50-horsepower motor-driven ventilating fan.

Blacking the hair side of the hide is the next operation. This is a manual process, upon the completion of which the hides are passed through jacks. The function of these jacks is to smooth the hide and force the black into all the pores. In the blacking department there is a battery of three jacks operated by a 10-horsepower motor. After jacking, the hides are allowed to dry, forced air being supplied in the drying room by a motor-driven fan. The motor is of 15-horsepower size and is belted to the fan.

The finishing process is the last stage of the process of preparing harness leather. In this department there is installed a ventilating fan driven by a 15-horsepower motor, a conveyor operated by a 15-horsepower motor, two jacks driven by 20-horsepower motors, and a 10-horsepower motor which operates an electric elevator.

For tanning sole leather the process is much simplified. The preliminary operations are practically identical with those employed in tanning harness leather. After the hides are scoured after tanning they are taken to the extract department, where they pass through motor-operated wringers, oil wheels and extract wheels. There are two wringers in this department, each belted to a shaft which is driven by a 40-horsepower motor. To oil the hides they are placed into large oil wheels operated by a 40-horsepower motor and from there they are placed into extract tubs. These tubs revolving at a high rate of speed force the extract into the hides making them practically waterproof and giving them added weight and thickness. A 75-horsepower motor operates the two extract wheels employed in this department.

From this department the hides are taken to the finishing department in which is installed a stamping and cutting machine, four rolling machines and a motor-driven fan. The motors which drive the two elevators in this building are also installed in the finishing department. After being thoroughly dried, the hides from the extract department are trimmed on the stamping and cutting machine, which is driven by a five-horsepower motor, and then placed on the rolling machines. There are three rolling machines, operated as follows: One operated by a 30-horsepower motor, and two by 20-horsepower motors. These machines smooth out the hides and they are then ready for shipment.

Central-Station Advertising in German.

An interesting form of class advertising is now being used by the Louisville Lighting Company, of Louisville, Ky. In appealing to the astute German population of the Gateway City, the company has devised an excellent medium—a neatly-printed circular the "copy" for which is written in the tongue of the Fatherland.

The circular, which is distributed broadcast to callers at the company's offices, is headed, "Zu jeder Stunde von Jedem Tage dient Ihnen die Elektricitat im richtiger Weise," the free translation of which is "Electricity serves you in manifold ways every hour of the day." Then there are three illustrative cuts portraying a pretty Fräulein using an electric pad, an electric scalp massage and an electric candle, the pictures being headed respectively, "Guten Morgen," "Guten Tag," and "Gute Nacht."

More German copy is used, telling of the uses of the three electric devices illustrated. The circular is a novel one, but very effective, for the German-speaking population of Louisville is large.

The Edison Electric Illuminating Company, of Boston, has distributed to all its customers copies of the latest issue of its publication, *Edison Life*, which contains special features in commemoration of the twenty-fifth anniversary of President Edgar's association with the company. The management calls attention to the cordial relations existing between the company and its employees and expresses the belief that "the high standard of the company's intention toward its customers of rendering them the best possible service will be more fully appreciated by a realization on their part that one of the elements of this service is keen interest and harmonious co-operation among the employees, fostered by a reciprocal interest in their personal welfare on the part of the company."

Tannery Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Tannery, name withheld, having an average daily output of 300 to 350 tanned hides. There are 140 men employed, working 10 hours per day.

Total connected horsepower, 137.5. Number of motors, 10. Kilowatt-hours per month, 6,820.

Kilowatt-hour consumption for 12 months: January, 8,220; February, 11,640; March, 9,120; April, 5,130; May, 8,390; June, 14,350; July, 6,950; August, 2,010; September, ———; October, 4,540; November, 2,170; December, 2,510. Load-factor, 9.1 per cent; operating-time load-factor, 20 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is two-phase, 60 cycles, 220 volts. All motors are of the squirrel-cage induction type.

No.	Horse-power	Speed R. P. M.	Application.
1	15	1,120	Belted to a 50-foot shaft (eight hangers) and a 15-foot countershaft (four hangers), driving three glazing machines, 140 strokes per minute; two eight-foot by four-foot tanning drums, 20 revolutions per minute; and two tanning paddles.
1	30	1,120	Belted to a 60-foot shaft (ten hangers), driving two eight-foot by four-foot tanning drums, 20 revolutions per minute; three 22-inch by eight-inch buck tails (polishing wheels), 1,500 revolutions per minute; one Buffalo No. 4 exhaust fan (for buck tails); two Rood Vaughn shaving machines, 1,600 revolutions per minute; two rubber-roll putting-out machines (putting-out rolls four-feet and five-feet respectively); one triplex five-inch by five-inch plunger pump, 32 revolutions per minute; one duplex three and one-half-inch by five-inch plunger pump, 48 revolutions per minute, and one 1,000-pound freight elevator.
1	10	1,120	Belted to a 40-foot shaft (eight hangers), driving three eight-foot by four-foot tanning drums, 18 revolutions per minute, two measuring machines (Nightingale and Sawer makes), driven pulleys 16 inches in diameter, and one Turner four-table putting-out machine.
1	20	1,120	Belted to a two-hanger shaft and a 35-foot shaft (six hangers), driving one Turner four-table putting-out machine; three tanning paddles; three bate wheels or paddles; one F. F. Slocomb stamp; nine F. F. Slocom stakers, flywheel 33 inches in diameter, rim five inches by two inches; five Becker ironing machines, rolls electrically heated; and one 24-inch by 2.5-inch grindstone.
1	5	1,120	Belted to a six-foot, two-hanger shaft, driving one Vaughn fleshing machine (skins carried against an emery-faced roll by a 36-inch by 60-inch revolving roll), and one 100-pound elevator.
1	20	1,120	Belted to a three-hanger shaft and a 35-foot shaft (eight hangers), driving two Steele Brothers stocks; three six-foot by five-foot tanning drums, 15 revolutions per minute, and one tanning paddle, 29 revolutions per minute.
1	10	1,120	Belted to a 15-foot shaft (three hangers) and a two-hanger countershaft, driving one Sargent Wood dryer; and one Buffalo No. 4 blower; driven pulley 4.5 inches.
1	7.5	1,120	Belted to a five-foot two-hanger shaft driving a Tolhurst 40-inch centrifugal extractor.
1	5	1,120	Belted to a 48-inch by 24-inch iron paddle wheel on a wool washer.
1	15	1,120	Belted to a shaft (three hangers) and a two-hanger countershaft, driving four soda paddles, and three six-foot by five-foot drums.

J. Greenebaum, Chicago, Ill. This plant tans horse hides, cow hides and sheep skins, the leather being used for shoes and gloves.

Total connected horsepower, 127. Number of motors, 11. Average kilowatt-hours per month, 6,820.

Kilowatt-hour consumption for 12 months: January, 2,510; February, 2,170; March, 4,540; April, 5,300; May, 2,010; June, 6,950; July, 14,350; August, 8,390; September, 5,130; October, 9,120; November, 11,640; December 8,220. Load-factor, 9.8 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts. All motors are of the squirrel-cage induction type.

No.	Horse-power	Speed R. P. M.	Application.
1	20	1,800	Belted to a line shaft driving 10 Baker staking machines.
1	7.5	1,800	Belted to a countershaft driving two shaving machines.
1	7.5	1,800	Belted to a line shaft driving four drums, 8 feet long by 4.5 feet in diameter.
1	15	1,200	Belted to a line shaft driving two buffing wheels, 2,000 revolutions per minute.
2	0.75	1,140	Each belted direct to a Turner measuring machine.
1	10	1,800	Belted direct to a splitting machine.
1	7.5	1,800	Belted direct to a splitting machine.
1	50	900	Belted to a line shaft driving two fleshing machines; one unhairing machine, and two drums eight feet long by 4.5 feet in diameter.
1	0.5	1,200	Direct connected to a ventilating fan.
1	7.5	1,200	Slip-ring motor driving two-ton elevator.

Tannery Data—Sheet No. 2.

St. Paul Tannery, St. Paul, Minn. Group drive. Running hours per week, 60.
Total connected horsepower, 301. Number of motors, 32. Average kilowatt-hours per montl., 13,255.
Kilowatt-hour consumption for five months: June, 12,000; July, 11,800; August, 14,900: September, 13,000; October, 13,200. Load-factor, 9.4 per cent; operating-time load-factor, 22 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power	Speed R. P. M.	Application.
1	5	1,720	Belted to line shaft driving one stuffing drum; and one stuffing mixer.
1	15	1,720	Belted direct to one freight elevator.
1	10	1,720	Belted to line shaft driving one leather press; one leather scourer; and one shaving machine.
1	15	1,720	Belted to line shaft driving one washing drum; one paring machine; and one lye mixer.
1	30	1,720	Belted to line shaft driving one splitter; one slide fleshing machine; one whole hide flesher; and one lime vat.
1	5	1,720	Belted to shaft driving 12 rockers.
1	10	1,720	Belted to line shaft, driving one pigskin leather roller; and six paddle vats.
1	20	1,720	Belted to line shaft driving three drums.
1	20	1,720	Belted to line shaft driving three drums; and one dissolving reel.
1	7.5	1,720	Belted to line shaft driving three rolling jacks; and one shaving machine.
1	5	1,720	Belted to line shaft driving one Slocum staker; one Baker staker; one clipping machine; and one Standard measuring machine.
1	5	1,720	Belted to line shaft driving one set Shealing buffing wheels; one set Shealing combing machines; and one set light buffing machines.
1	5	1,720	Belted direct to one cleaning drum.
1	2	1,720	Belted direct to one setting-out machine.
4	7.5	1,720	Each belted direct to one six-foot drying room fan.
2	5	1,720	Each belted to a line shaft driving four pigskin paddle vats.
1	10	1,720	Belted direct to one spent-bark conveyor from leach house to boilers.
1	10	1,720	Belted direct to one bark grinder fan.
1	20	1,720	Belted direct to one bark grinder.
1	7.5	1,720	Belted direct to one spent-bark elevator.
1	20	1,720	Belted direct to one sheepskin flesher.
1	5	1,720	Belted direct to line shaft driving two sheepskin scrubbers; one hair dryer; and one hair washer.
1	10	1,720	Belted to line shaft driving 10 paddle vats; and two washing drums.
1	5	1,720	Belted to line shaft driving four paddle vats; and one liquor pump.
2	7.5	1,720	Each belted to a line shaft driving eight pigskin paddle vats.
1	2	1,720	Belted direct to one leach casting machine.
1	2	1,720	Belted direct to one lime reel.

Tannery, name withheld, importing hides suitable for the manufacture of shoe uppers. There are 200 men employed, working 10 hours per day, during which time 300 dozen hides are finished.
Total connected horsepower, 278.5. Motors installed, 16. Average kilowatt-hours per month, 21,561.
Kilowatt-hour consumption for 12 months: January, 24,380; February, 22,450; March, 24,410; April, 24,750; May, 20,360; June, 19,460; July, 20,000; August, 21,920; September, 19,870; October, 21,910; November, 18,660; December, 20,750.
Load-factor, 13 per cent. Operating-time load-factor, 33 per cent.
The electrical energy consumption per thousand hides tanned is 287 kilowatt-hours.

MOTOR INSTALLATION.

The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power	Speed R. P. M.	Application.
1	50	685	Belted to 68 feet of shafting (12 hangers), driving three Booth & Company 10-foot breaking drums; and one freight elevator.
1	30	850	Belted to 182 feet of shafting (32 hangers), driving three Booth & Company 12-foot washing drums, 12 paddles, and two fleshing machines.
1	30	850	Belted to 110 feet of shafting (22 hangers), driving five Booth & Company 12-foot washing drums; two Booth & Company paddles; and one B. F. Sturtevant No. 35 blower.
1	30	850	Belted to 68 feet of shafting (15 hangers), driving six Booth & Company tanning drums; and two Booth & Company paddles.
1	30	850	Belted to 85 feet of shafting (19 hangers), driving 15 Slocum staking machines; and four Booth & Company paddles.
1	7.5	1,120	Belted through a 10-foot shaft (three hangers) to a setting-out machine.
1	20	840	Belted to 66 feet of shafting (10 hangers), driving one Buffalo No. 00 48-inch blower; eight 20-inch by six-inch buffing wheels; and one brusher.
1	10	1,120	Belted through two four-foot countershafts to a hair-washing machine, 100 revolutions per minute.
1	15	1,120	Belted through a 12-foot shaft (four hangers) to a hair-drying machine.
1	7.5	1,120	Belted through a countershaft to a pulling-out machine.
1	20	840	Belted to a 30-foot shaft (six hangers), driving one B. F. Sturtevant 30-inch blower; and three shaving machines.
1	10	1,120	Belted to a freight elevator.
1	3	1,120	Belted through a countershaft to a 36-inch centrifugal extractor.
1	7.5	850	Belted to a wool press.
1	7.5	1,120	Belted to a Buffalo 30-inch blower.
1	0.5		Belted to three two-hanger countershafts driving two Turner Leather Machinery Company size five measuring machines.

Commercial Practice
Management, Rates, New Business

ELECTRIC SIGNS.[1]

By George E. Fuller.

The tungsten lamp wrought a revolution in electric lighting but it was a revolution in line with progress, and we are agreed that the results have been universally good, although for a time we dreaded its effects on our lighting load. The Mazda sign lamp as applied to the electric sign business has wrought an even greater revolution, for it has changed the basis of remuneration to the central station from a revenue based on kilowatt-hour consumption to one of service. Some of us still cling to the theory that our sign-business profits are dependent on our kilowatt consumption, but if we would balance up the sign business in this day and age, it must be with Mazda sign lamps and service.

Central stations throughout the country have been reluctant to adopt the tungsten sign lamp with its necessary concomitant of service. Some central stations which have developed a large carbon-lamp sign business are unwilling to go out after new business, through their fear that if they sell tungsten signs, their carbon sign customers will notice the change and will want tungsten lamps, thereby cutting off a part of their kilowatt-hour revenue. Other central stations which consider it profitable to develop carbon sign business have concluded that inasmuch as the revenue from tungsten signs is cut in half, that decrease would make a difference between profit and loss on their books and that it would not, therefore, be worth their while to attempt to develop tungsten-sign business.

Now this question of profit in the sign business is the most vital one of all and before taking up what I consider the new basis of service on which the sign business rests today, I would call your attention to some comparisons between inside lighting and sign lighting on the basis of per kilowatt of station capacity, which because of the investment feature in figuring central station profits, is the true basis of comparison.

It has been found that taken all in all throughout the country, in the large cities and in the small, two dollars per month is the average residence lighting bill and 15 outlets is the average number for each residence; probably the rate is about 10 cents per kilowatt-hour. Now we can consider that each of these outlets is a 40-watt lamp. Some will, of course, run a great deal higher than this, others somewhat lower perhaps, but 40 watts may be taken as a fair average per outlet.

On this basis it appears that 15 outlets of 40 watts each result in only $2.00 per month revenue to the central station, that is to say, 15 times 40 watts or six-tenths kilowatt station capacity yield $2.00 per month or $24 per year. One kilowatt of station capacity, therefore, is represented by $40 per year.

Now consider a sign containing 48 five-watt Mazda lamps, burning on a flat rate five hours per night, every night of the year. Such a sign would be rated at twenty-four one hundredths kilowatts, which, figured at three cents per kilowatt-hour, represents $13.14 revenue per month or $54.75 per year per kilowatt of station capacity; that is to say, inside lighting figures $40 and sign lighting at three cents per kilowatt-hour, figures $54.75 per kilowatt of station capacity.

These figures are conservative; the average rate for sign lighting is considerably more than three cents per kilowatt-hour. In Iowa the rates hardly go below six cents per kilowatt-hour; in Illinois the lowest rate I am familiar with is 4.5 cents. In some of the Southern states and in isolated instances the rates will be somewhat lower than three cents, but certainly the three-cent rate for purposes of comparison is extremely conservative.

Furthermore, a large percentage of signs will contain more than 48 lamps. As you know, a double-faced 16-inch "EAT" sign contains 46 lamps, a "CAFE" sign 62 and a "DRUGS" sign 88; so that 46 lamps, which we have taken as the basis for comparison is also very conservative.

However, I am quoting these conservative figures so that if you substitute figures taken from your books for the general figures I have quoted you will see that there is a very comfortable margin of profit with which to pay for the additional service which goes with a flat-rate Mazda sign business.

My figures are based on a flat rate for sign lighting. I regard a flat rate as the first principle in building up a successful sign business, although I know that there is some opposition to it on general principles. However, experience sooner or later shows us the need of a flat rate. We have labored persistently to sell a sign to the largest merchant in our city and we have had the satisfaction of seeing him install and pay for the most beautiful sign within many miles; we have seen him burn that sign enthusiastically while it was new and we have watched his enthusiasm wane as the novelty wore off, with the result that in a few months the merchant decided to burn the sign only on Saturday nights or to celebrate some special occasion. We had overlooked the need of a flat-rate contract with that customer in our enthusiasm to sell a good looking sign.

Sometime we will learn that a flat rate is sign business insurance and without it we can only have a demoralized and disappointing sign business.

A flat rate with carbon lamps required only that the central station switch the signs at certain fixed hours; the introduction of the tungsten lamp has made it necessary to add to that switching service, the service of renewing lamps and of painting or washing signs as necessary. Tungsten lamps will burn out; every renewal costs money; somebody has got to pay for it and the customer is unwilling to take the chance. But you can safely take the chance as many of you have already found the average life of a tungsten lamp is in excess of 1,200 hours and will sometimes exceed 1,800 hours under favorable circumstances. Two complete installations per year will furnish a very conservative basis for figuring a flat rate and the expense of one repainting of a new sign will very well take care of another item to be included in the flat rate. Energy can be figured at a slightly higher rate than the carbon lamp kilowatt-hour rate and when you have added all of these items together and have included a pro rata maintenance expense apportioned among your present sign customers, you will find that you can add in a profit on the maintenance service and work out a flat rate per lamp per week

[1] From a paper read before the recent convention of the Illinois State Electric Association.

which will prove very attractive to even the smallest of sign customers.

You will then be getting not only a higher rate and correspondingly larger profit on the energy of tungsten signs but will secure a profit on the maintenance service which goes with them. And these two profits can very easily be made to equal or exceed the profits based only on carbon-lamp consumption.

This maintenance proposition included in a flat rate is nothing more nor less than an advertising service, and as such invites attention not only in the matter of getting new sign business but in taking care of the old.

Signs today are incidental to an advertising service and unless the central station is willing to provide adequate service, the sign business is sure to react upon the central station. I have recently gone through towns which were a few years ago the pride of the sign-man's heart. Today these same signs, unkempt and unlighted, hang like spectres of bygone prosperity, a warning to other merchants, "Never Again," all for lack of service. Is it any wonder that there is little new business to be secured and would it be profitable to try to secure it under such conditions?

To the central station which is beginning to experience a stagnation in the sign business or a reaction against it, I would ask what service have you supplied? What systematic effort have you made to give your customer advertising value from his investment? Have you a flat rate that provides lamp renewals? Do you freshen up a sign's complexion with a good soap and water washing? Have you ever repainted the iron work to keep it from rusting and discoloring not only the signs themselves but the buildings on which they are hung? Do you inspect the signs and the hanging rig to see that everything is secure? It would be a serious matter to have a sign fall and break a plate glass window or injure or kill a passerby, and here it is not only a question of the damage for which you or your customer would be liable but it is the disrepute into which the sign business in any town would suddenly be projected by such accident.

How many of your dead signs can you renew on a two-year flat-rate contract which provides for tungsten lamps and renewals? How many of your customers would renew for another two years if you suggested a simple double-pole flasher or color caps or some little cheap attraction that would give added advertising value to the sign when taken in connection with the service of renewing lamps, etc? There are a hundred little schemes that you could adopt to put these signs back on the burning and even if it would require the investment of a transformer or some other improvement, this expense might well be taken care of in the flat rate you would make for a two-year period.

The problem of getting new sign business involves the question of taking care of the old business on the basis of an adequate advertising service intended to give the customer advertising results.

But in offering your customer a service proposition you are only keeping abreast of the times. Newspapers, magazines and advertising syndicates give a service with their respective propositions and central stations might well give a service with theirs. If a rain storm ruins a bill-board poster during the life of the contract, the company pastes up a new one without extra charge. If a newspaper advertiser wants someone to write copy for him, the newspapers are generally only too glad to supply a thoroughly experienced man for that work. Magazines constantly boost for their advertisers by offering prizes, etc., to readers. Yet many of us central-station boosters forget that the sign business as an advertising proposition carries with it an obligation on our part to give a customer service which will at least keep his sign, that is his medium of reaching the people, as attractive as possible.

To further carry out the idea of an advertising service I would like to speak of display signs and signs of greater utility than display signs, suitable for electric light companies, department stores and other large businesses.

We know that outside of the large cities there is and can be very little display sign business, that is, you will have few customers willing to meet the investment of two or three thousand dollars for a large display roof sign and the large monthly maintenance expense. A man who will spend two or three thousand dollars for a display sign is one who has built up a successful business and is more interested in having his name before the townspeople than he is in the advertising value he is receiving. To my mind that is not, strictly speaking, an advertising basis. Certainly not as applied to small towns, although in Chicago or New York and a few other large cities, where such a sign would be read by hundreds of thousands of people, its advertising value could hardly be questioned.

To my mind the proof that this display sign proposition is not first-class advertising in the smaller cities is shown by the fact that the live advertisers, that is merchants and others who are spending money for other advertising, have not taken readily to the display sign.

This is not due to the fault of your salesman or even to the investment feature involved, but is due rather to the fact that a large sign, no matter how beautiful or attractive, would not fill the merchant's needs as good advertising. It would not back up his newspaper advertising.

It is a question, then, of making this display sign flexible enough to meet the requirements of the up-to-date merchant. This can be done if we can develop a service which will include changing the reading matter on such signs and if we can at the same time keep the price of this service low enough so that it compares favorably with newspaper rates on the basis of circulation, that is the number of people reading it.

Suppose for the sake of argument, you have in mind at this moment a large newspaper advertiser who has not an electric sign. We will assume that this merchant has a location where a sign on his roof or on the side of the building would be read by many thousands of people every night. You have probably talked to this merchant about a display sign, one of the kind with blazing torches or running water or some other attractive flashing feature. He has told you that such a sign would be a white elephant in a year and you have never been able to close a deal with him. Now you go to him with the proposition of making his electric sign supplement his newspaper advertising. Right now he is advertising his fall opening; the sign should, therefore, call attention to his fall opening, and, of course, emphasize his name so that the two ideas will be clinched on the sign. Next month this same customer wants to advertise woolen goods, overcoats, winter furnishings, etc.; in December he is pushing his Christmas business, toys, gifts, etc.; in January he has a sale of white goods, and throughout the year he has some special feature to advertise. He ought to change the reading matter of his sign; and this is much the central station's own proposition. How much more effective your own sign would be if you could and would change the letters so that when you are pushing a house-wiring campaign you could say "For 30 days houses wired at cost," etc., or when you have a campaign to sell flat irons, change the sign so that in place of your house wiring advertising it would be "Flat Irons 30 Days' Free Trial," or something else along the same line. In this respect the central station and the up-to-date store have much in common.

Of course, you are saying this

scheme of changing letters for merchants and for yourselves would require too large an investment and would be too much trouble to keep in operation. Well, if you are willing to take the trouble, it is not difficult to take care of the investment which can be done in several ways. First, sell one change of reading matter to the merchant; then as he wants new copy eliminate the letters he already has and buy only those he has not. A two-foot or 30-inch half block letter will generally serve all practical purposes and these will not cost the merchant very much as compared to the advertising value he will receive. And even if he wants 12 changes in the course of a year, the chances are his actual investment in letters will not be over 15 per cent of the total number of letters required for all changes.

But assume that the merchant is unwilling to make the investment necessary for several changes of letters, but on the other hand is willing to make the investment in the frame work of a sign with his name or trade mark in illuminated letters and would sign a two-year flat-rate contract, providing you would make the investment of the changeable letters. In many such instances I believe the central station could afford to make the investment, writing it off over the two year period of the flat-rate contract.

To figure out a flat rate to take care of the investment you could ascertain how many letters would be required for the 24 monthly readings and then at the end of the two years your flat rate would have written off the original investment and you would still own the letters and would have added materially to your sign load.

If you can interest three or four merchants in signs of this character and give them all the same size changeable letters, you could somewhat reduce your flat rate as your investment would not be in proportion to the number of such signs you could install, and it is my opinion that a large and profitable business could be developed both for the central station and for the merchant who would undoubtedly gain quick results from this form of advertising.

I realize that this is a radical proposition to advance. It would require careful, intelligent handling and comprehensive developments and results would probably not come in a day; but as a part of the advertising service which would apply to the street signs and flashing devices as well as to the changeable reading display signs, it is, I believe, a proposition worthy of earnest consideration.

Advertising Electric Trucks by Illuminated Display Signs.

Advertising on illuminated signboards has been an important part in the electric-vehicle campaign which the Commonwealth Edison Company has been carrying on in Chicago. In various parts of the city which are passed by the greatest number of people, signs are placed carrying the design shown in the accompanying illustration.

Billboard Signs Used by Commonwealth Edison Company.

The value of this class of advertising is undoubted, and the vivid manner in which the argument is placed before the public makes a lasting impression on anyone who is at all interested in the problem of city transportation. In this case the value of the advertisement is enhanced by the silhouette effect of the illustration.

It is estimated that the 25 signs at present carrying the electric-truck advertisement are passed daily by over 1,000,000 people.

Street Lighting Rate in Denver.

An agreement was recently reached between Mayor Henry J. Arnold, of Denver, Colo., and the officers of the Denver Gas & Electric Light Company which will result in a saving to the city for street lighting of $377,500 during the next 14 years. The reductions will be made by the company every four years, beginning with a cut from $60 to $55 per arc lamp for the first four years; to $50 for the second period and $45 for the third period of four years. The entire saving to the city from this reduction will be $187,500. The reduced cost of incandescent lamps to the city will be from $28 to $20 per lamp for the next 14 years, a saving of $190,000.

Program Advertising for Central Stations.

In devising a series of historical sketches, telling of the progress of electricity from the time of its origin to the present, the Louisville Lighting Company, of Louisville, Ky., has not only perfected a new and extremely interesting style of advertising "copy," but has also entered a new medium with it. The company has entered theater programs in its campaign to increase the consumption of electricity in the Falls City.

The programs of three of Louisville's leading theaters are used, at Macauley's where Klaw & Erlanger attractions are presented, at the Shubert Masonic, operated by Sam and Lee Shubert, and at B. F. Keith's Mary Anderson theater. The advisability of program advertising is questioned by some advertisers, but not so with the Louisville Lighting Company. The sales department of the company believes that every effort is made by theater owners to make their programs valuable to the advertiser, in that ticket contests and other features are employed to make the patron take this program home with him and scan its contents closely. That one of the best times to present a selling argument is when the prospect is relaxed and prepared to listen to something for his own edification, as in the theater, is the argument of the Louisville Lighting sales experts.

The Mary Anderson programs contain straight display advertisements of the central station. The management of the vaudeville theater has made its printed matter readable through offering reserved seats free every week for those who read the advertisements closely and solve a puzzle contained therein.

In the Macauley's and Masonic programs, which go to the highest-class theater patrons in the city, the lighting company employs a series of biographical sketches of electricians who made themeselves famous in the past and present. Ohm, Ampere, Watt, Edison and others have been used, with illustrations which lend force to the half-page of matter telling of the careers of these genii of the dynamo. This type of "copy" appeals forcibly to the patrons of the Klaw & Erlanger and Shubert houses.

Electrical Construction

FIRE ALARM SYSTEMS.—III.

The Automatic Closed-Circuit Installation in Rockford.

It used to be common practice to divide fire-alarm systems, for convenience of classification, into three groups. In the first group were included installations, whose performance was entirely automatic. The second group included systems in which the first part of the alarm was received by an operator at a central office, who immediately connected the circuit over which the alarm was coming in with another circuit to fire headquarters and thus provided for the transmission of signals directly to the firemen. The third group consisted of large installations arranged so that calls must be sent to the central office and repeated from there to fire headquarters. Automatic, semi-automatic and manual these systems were respectively styled.

This classification is frequently rather convenient still. In preceding articles of this series of papers on fire-alarms an automatic installation used in a large private plant, and another possessing certain characteristics of semi-automatic operation were described. The present article will deal with the system used by the city of Rockford, Ill., which is entirely of the automatic type. This is a closed-circuit system.

In principle of operation the closed-circuit fire-alarm is quite simple. Fig. 1 is an elementary diagram of a closed-circuit alarm. Normally, current from battery *LB* holds the armature of electromagnet *LM* away from terminal *a* in the circuit of battery *B*, thus keeping the circuit of the alarm bell open. When a street box is pulled the rotation of a code wheel, such as *3* in Fig. 1, causes a successive opening of the circuit at *g* as the sliding contact-spring *e* drops into notches in the wheel. It is easy to see that the single-stroke bell shown in the figure will sound in step with the breaking of the circuit of battery *LB*. The spacing of the notches obviously determines the character of the alarm. In actual practice the battery *B* may be dispensed with and all bells and similar appliances operated by electromagnets connected in circuit just as *LM* is connected. This is the scheme employed in the plant to be described in this article.

Rockford undertook to supply itself with fire-alarm service in 1877, when an installation of three street signal boxes and one alarm gong was put in. This has been added to from year to year, so that now there are four circuits covering the city—which has 50,000 inhabitants or so—very completely, and including a total of 95 street signal boxes. There are six fire houses. Each one of these is equipped with the gongs, or alarm bells, and the punching registers necessary for properly receiving alarms of fire. At what is known as Fire House No. 1 the central office of the system is located. The equipment in this office comprises a storage battery for supplying current for the operation of all the circuits, an automatic repeater and a switchboard through which the storage cells are charged and from which the street-box circuits radiate.

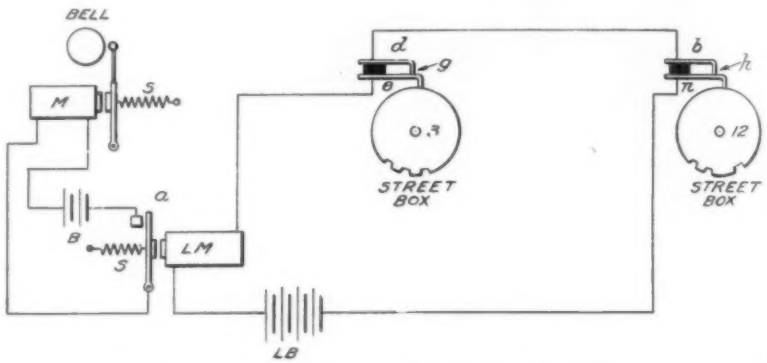


Fig. 1.—Elementary Diagram of Closed-Circuit Fire Alarm.

The Rockford installation was put in by the Gamewell Fire Alarm Telegraph Company, the makers of the apparatus used.

Street Circuits and Signaling Boxes.

The four circuits of the system total some 60 miles in length. In the denser business section of the city the circuits are run underground. Here lead-covered cables containing No. 14 B. & S. gauge rubber-covered copper conductors are drawn into conduits of vitrified clay laid at a convenient distance below the surface of the street. There is also 600 feet of overhead cable, this being of the same construction as that used underground. The remaining portions of the circuits are run as ordinary open lines. No. 10 B. & S. gauge hard-drawn copper wire is used on all open aerial lines, this material including both bare and insulated conductors. It is understood, of course, that only complete metallic circuits are employed in the system. Where they are convenient, poles of the telephone company are used in the overhead distribution; and in other places the city uses its own poles.

Where the circuits are brought down to the signal boxes, the two wires are run in half-inch galvanized-iron pipes extending in every case from the box to a point well up toward the top of the pole, where the pipe terminates in a fitting so designed as to keep the inside of it dry, these terminal fittings being supplied by the company which manufactures the fire-alarm apparatus used. This sort of construction practically eliminates the liability of wires being broken by linemen in climbing poles, or by anybody who might deliberately attempt to cripple the service on some circuit.

The installation includes several different styles of street signaling boxes. Those placed in service when the beginnings of the present system were made, which, as has been stated already, was in 1877, were then of the most improved type. These are still in use, and are said to be giving satisfactory service. Whenever boxes have been added to the alarm circuits, the newest and most suitable type has been bought. It is thus seen how it hap-

pens that the system includes both some of the older and some of the latest types of boxes.

For the benefit of readers not familiar with the operation of the modern, street signaling box, used to turn in alarms of fire, the principle will be explained more fully than in the preceding paragraph. Fig. 2, which represents roughly the principal parts of one of the boxes in one of the Rockford circuits, will be employed in this explanation. In the figure W_3 is the code wheel. As the figure shows, the edge of the wheel is cut so as to leave it with one notch separated from a group of five other notches. It will be seen presently how the arrangement of these notches causes the gongs in the fire houses to sound one stroke and then after a short interval is designated by the letter *A*. The inner end of the lever *A* touches the lower surface of the disk *D*, on the upper edge of which rests one end of the beam *L*, the arrangement being such that the end of *A* does not project far enough back to carry it under beam *L*. Disk *D* is on the lower end of a small pin which can be pushed upward into the hollow armature *a* of the electromagnet M_2. Beam *L* has a notch in it at *C* and a pin at *e*, and when the train of wheels is at rest the notch fits over a small pin projecting horizontally from the side of the wheel W_3, thus holding the clock movement.

When the person sending in the alarm of fire, opens the outer door of the signaling box and pulls down lever *A*, beam *L* is lifted off of the pin at

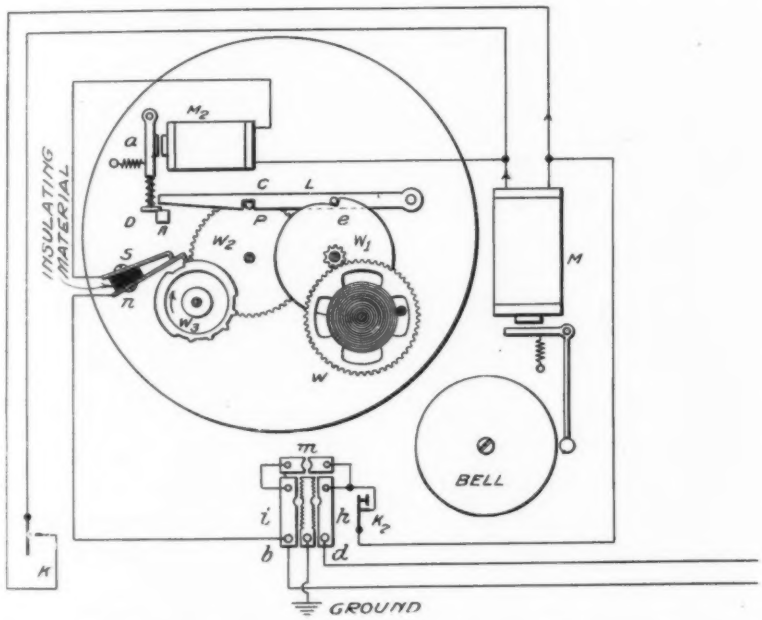


Fig. 2.—Diagram Showing How Clock Movement is Released and Current Interrupted.

to sound five other strokes in quick succession. The wheel W_1, which is driven by clockwork, is geared to the larger wheel just above it, and from this latter wheel the wheel W_2 and finally W_3 are driven. The normal direction of rotation of W_3 is indicated by the arrow on it.

All the mechanism shown in Fig. 2 is contained in the iron box installed on the street pole, and in the front of this box there are two doors. Breaking a small glass window in the outer one of these two doors gives access to the key of that door. By opening this door, the end of a lever extending through an opening in the inner door —which cannot be opened except by the man in charge of the system or his representative—is reached. This lever is shown in cross-section in Fig. 2 and *C* and out of notch *e* and the clock movement which rotates code wheel W_3 is released. Rotation of this wheel commences at once. When a notch reaches the sliding contact *n*, the end of *n* drops into this notch and causes a separation between the metal springs *n* and *s*, thus breaking the alarm circuit and causing the gongs at fire headquarters to make one stroke. As the other notches pass successively under the spring *n* the remaining strokes of the signal occur. Also, simultaneously with each stroke of the bell a perforation is made in the paper ribbon by the punching register.

The two leads coming in at the points *d* and *b* in Fig. 2 are a part of the circuit from the central office. Assuming that the upper wire is the positive one, the path of the current is from *d* through the key K_2, shown in the lower part of the figure, this key being ordinarily kept closed. From here the current flows through electromagnet *M*; then through another magnet M_2, and to the negative side of the line by way of *s*, *n* and *b*. When the outer door of the box is closed, key *K*, at the left-hand side of the figure, is held closed so as to keep magnet *M* cut out of circuit.

The function of magnet *M* is to operate the bell shown below it. When a box is pulled the ringing of this bell keeps step with the sounding of the gong at fire headquarters, and thus the person who pulled the box is assured that the alarm is going in properly. Moreover, if the outer door of a street box is opened while an alarm is going in over the same circuit from some other box, the ringing of this bell immediately makes known the fact that an alarm is going in already.

The key K_2 becomes accessible when the inner door of the box is opened. It is used by firemen and others in authority to send signals to fire headquarters. For example, when a fire has been got under control this key is operated to send in a signal to that effect; or, in case additional engines are wanted at a fire, a call for them may be turned in by the manipulation of K_2.

It is usual to provide street signaling boxes with lightning protection. The lightning arrester is shown at the bottom of Fig. 2, the wire from it to ground being made short in order to save space. In connection with this part of the figure it will be noted that by the insertion of a plug at *m* the box shown in Fig. 2 may be cut out of circuit. This is convenient when it is desired to test or make changes in the clock movement of the box without causing confusion at fire headquarters. By plugging at *h* or *i* either side of the line may be grounded, as the figure shows.

The first break in the circuit after a street box has been pulled causes electromagnet M_2 to release its armature *a*, and this is drawn so far away by the spring shown that the magnet is not able to pull it back into place again until it is shoved back nearer to the magnet by the closing of the outer door of the box. Moreover, when this armature is pulled to one side by the spring it moves the edge of the disk *d* from above the end of the lever *A*, and hence a second pull on the lever *A* will not cause any disturbance in the transmission of the alarm started in by the first pull whatever. To start the box the lever *A* is pulled down once and let go; any subsequent pulling before the code wheel W_3 has completed the number of revolutions it

was designed to make produces no effect.

Wheel W_2 revolves twice while the wheel W_1 makes one revolution. In this interval the code wheel W_3 makes four complete turns. After lever L has been lifted off of the pin at C the pin c rides on the surface of wheel

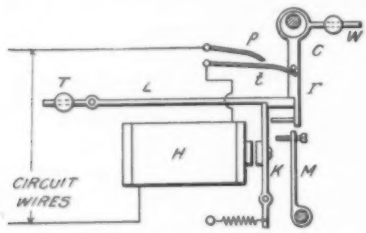


Fig. 3.—Portion of Repeater.

W_1 while that wheel is making a revolution, thus keeping the clock mechanism free to run. At the end of this revolution L drops down again and stops all rotation by engaging the pin at C.

It is clear from the foregoing that the set of signals is repeated at fire headquarters three successive times after the first round comes in.

Some of the latest boxes installed on the Rockford lines are of the so-called non-interfering successive types. When two boxes of this sort on the same circuit are pulled at or about the same instant one of them automatically takes possession of the line, and as soon as its four rounds of signals have been completed the other one comes in on the circuit and sends in the alarm from this second station.

It is hardly necessary to add to this discussion that the rims of no two code wheels in any installation are cut in the same manner. An alarm from the wheel shown in Fig. 2 would come in as a stroke and a pause and then five strokes in quick succession. Such a set of signals would in most small systems, be understood to mean that the alarm was coming from box No. 15, while a box arranged to send in say two strokes separated by a short

Fig. 4.—Punch Register.

interval from six quick strokes of the alarm apparatus at fire headquarters would be designated box No. 26.

Automatic Repeater.

It is not intended here to go into any detailed description of the automatic repeater used in the Rockford system, of which Fig. 6 is a photograph. An elementary idea as to how this piece of apparatus works, however, may be obtained from a study of Fig. 3. The repeater is installed at the central office. It is so designed that an alarm received over one circuit is automatically repeated over the other three, and so that an alarm coming in on one circuit cannot be interfered with by the pulling of a box on some other line. As a part of the repeater, there is an electromagnet H (Fig. 3) in each circuit. Under normal conditions the lever r, which works rather loosely on eccentric C, hangs vertically in a higher position than that occupied in Fig. 3, so as not to be in contact with beam L. The right-

Fig. 5.—Alarm Gong.

hand end of this beam L is, in the meantime, held clear of armature K by the weight T, the beam being pivoted just to the right of the weight. Armature K is held close to magnet H by the magnetic pull. As soon as the circuit is opened by the pulling of an alarm-box armature, K flies back to the right and the gear mechanism shown in the upper left-hand side of Fig. 6 is thus put into operation, with the result that the eccentric C is turned so as to lower lever r. On all the electromagnets H except the one in the circuit over which the alarm is coming, levers r push the ends of beams L down so as to lock armatures K in place and at the same time open the circuit between p and t. In this general way the repeater puts the other circuits under control of the one transmitting the alarm.

It is not hard to see that an accidental break in one circuit would cause the automatic repeater to cut that circuit out of service and leave the others operative. Moreover, the repeater shows which circuit has become disabled.

Gongs and Other Similar Apparatus.

The fire-alarm bells used on any modern system are of such simple con-

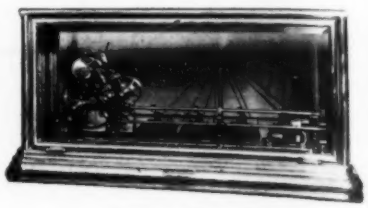


Fig. 6.—Repeater.

struction that any electrician of average attainments can easily become familiar with their construction and operation. Fig. 5 is one of the bells of the type used in the installation under consideration. These gongs are installed in the six fire houses of the city, in the police stations, and in the municipal water works plant. This pumping station is also equipped with a fire whistle, which is operated with steam. The fire whistle is blown whenever a fire is reported, and it can easily be heard all over the city.

Fig. 4 is a photograph of a punching register. The paper tape is drawn through the instrument by a clock movement, while the hard metal point which makes the perforations in it is operated by springs and electromagnetism. Although a register of this kind is not an absolutely essential part of a fire-alarm installation always, of course, it practically removes every possibility of mistakes as to the num-

Fig. 7.—Non-Interfering Successive Signaling Box.

ber of the street box from which an alarm is sent, and also affords a convenient means of keeping a permanent record of the alarm. Registers are sometimes provided with a device for recording the time of day an alarm is

received, in addition to the number of the box from which the call comes to the fire house.

The Switchboard.

Fig. 8 is a photograph of the switchboard in the central office of the fire-alarm system at Rockford. This is an automatic four-circuit board. It is arranged for taking care of charging the storage batteries from the lines of the Rockford Electric Company, and for the convenient control of the four alarm circuits of the system. The storage batteries are arranged in duplicate sets, so that while one set is on discharge, the other set may be charged. It is interesting to note in this connection that the current required of a battery discharging into one of the alarm circuits is but 0.1 of an ampere, this being the normal current needed to operate the circuit.

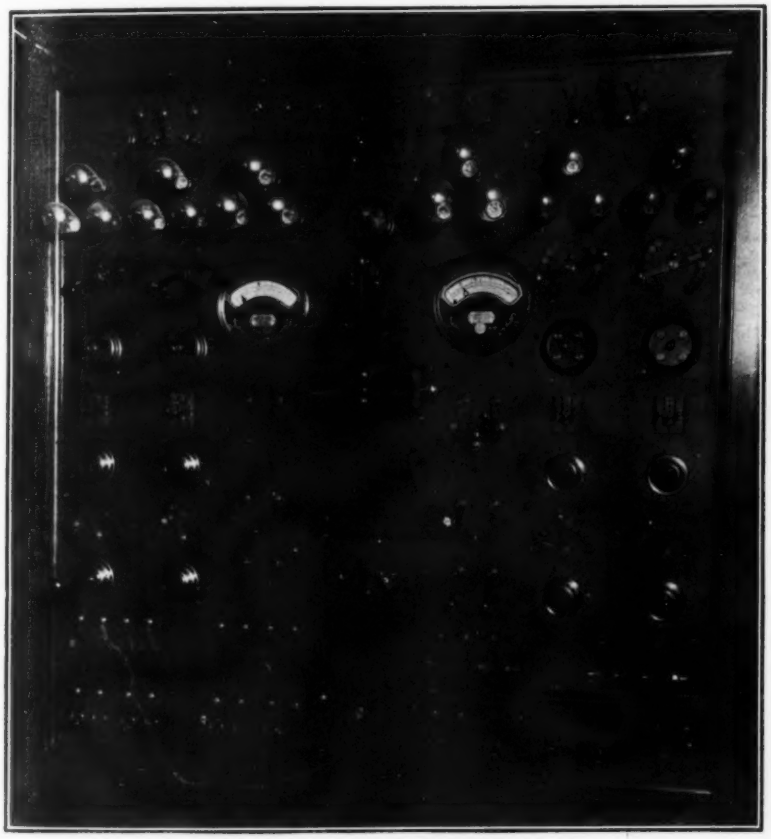


Fig. 8.—Switchboard.

The supply switch is mounted on the top of the board, at its center, and on either side of this there are switches arranged for securing different groupings of the storage cells in charging them. Cells may be thrown in series or in multiple, or into combinations of these two methods of connection.

Lamps on the switchboard supply resistance needed in the battery circuits. Between the two groups of lamps are the charging fuses. The rheostat handles seen just below the groups of lamps are provided for the purpose of making it possible to vary the resistance in a circuit by shifting lamps from one connection to another.

One of the two instruments on the board is an ammeter, and the other a voltmeter. The group of magnets located between and slightly below these instruments operate to throw the main knife switch at the top of the board open and disconnect the charging current in case the polarity of this current is wrong. Moreover, if for any reason the charging line temporarily loses its voltage, the charging circuit is automatically opened immediately.

The upper four of the eight plug receptacles are used in measuring the charging current and voltage of the batteries, the plug which is inserted during this procedure being connected by means of a flexible conductor to the instrument terminals. The lower receptacles are plugged into when it is desired to test the discharge rate and voltage on any line. Near these plug receptacles, on the front of the board, there are the arms of rheostats for adjusting the resistance in any one of the alarm circuits at will, and thus keeping the current in the line at the proper strength.

The gang switches near the bottom of the switchboard are employed in shifting batteries from charging on to the line and in making the change in the opposite direction. Below the gang switches, which are operated by means of a rack and a pinion, are located battery-terminal switches. These are convenient for removing any group of batteries from the board temporarily whenever such removal may become desirable.

The switchboard in question is also provided with lightning arresters, fuses in each of the four street circuits, and other accessories including provisions for taking care of the automatic repeater described above.

Maintenance of the System.

In the operation of a fire-alarm installation it is necessary, of course, that the storage batteries be given a reasonable amount of attention. If ordinary intelligence is exercised in the care of these, however, the liability of any serious difficulty is exceedingly remote. When the cells have been properly installed, about the only precautions necessary are to see that the electrolyte is kept at the proper density, and that the cells are correctly charged and discharged and not left idle long in the discharged condition. Careful, explicit directions for setting the battery up and taking care of it in operation are usually furnished by the manufacturers.

The City Electrician of Rockford states that his troubles with the installation there have been confined mainly to the outside circuits, and that these troubles have neither been frequent nor serious. He reports that in one case a wire which had been run on the outside of the wall of a building, without being inclosed in a pipe, broke without breaking the insulation. When the broken wire swayed slightly in the wind the circuit would open at the break and there would consequently be a stroke of the gong in the fire house. On account of the peculiar location of the break, there was some difficulty in finding it.

In another instance an arc-light wire came in contact with one side of an alarm circuit, and the arc circuit grounded in one of the underground cables of the fire-alarm system, burning out the rheostat installed on the switchboard for controlling the current strength in this particular alarm circuit. As a temporary substitute for the rheostat, incandescent lamps were used to put the line into commission again. It developed that but one wire of the alarm circuit had become grounded on the lead of the cable, and before this ground was definitely located there was some little annoyance due to a

telephone wire falling across the other side of the circuit and grounding it, thus cutting the current off from one of the fire houses and causing the gong there to ring.

Whenever it becomes necessary to hunt from a broken wire on a circuit at Rockford, both wires of the disabled circuit are taken loose from the switchboard and grounded there; and then tests are made at successive boxes along the line with a magneto connected between the wire and the ground. By noting whether the magneto rings or not it can be readily discovered when the break has been placed between switchboard and the man making the tests.

In looking for short-circuits and grounds in the underground cables, a portable exploring coil and telephone receiver are used. An appliance similar to an ordinary vibrating contact maker is put into the circuit at some convenient point, and thus a rapidly interrupted current is sent into the line. The exploring coil is then moved along over the cables in one manhole after another, the operator in the meantime listening continuously for the humming noise in the telephone receiver due to induction in the exploring coil. As soon as the fault is passed, as the operator moves farther away from the source of the current in the circuit, the humming noise ceases.

The installation described in the foregoing is in charge of Frank E. Thomas, the city fire marshal, and Fern Shaver, the city electrician of Rockford, and to them acknowledgments are due for painstaking courtesy and assistance to the writer in collecting data concerning the plant and its operation.

Multiple-Series and Series-Multiple.

In our issue of August 17 there appeared an article by Z. C. Adams, in which the use of the terms "series-multiple" and "multiple-series" was discussed. This article called forth several letters to the editor bearing upon the matter, which were published in our issue of September 7. The Standards Committee of the American Institute of Electrical Engineers has taken up this matter and now has it under consideration. A recent report by a subcommittee is to the effect that owing to the ambiguity and to the infrequent use of these terms, their use be discouraged and that there be recommended to replace them the following more explicit phrases: "series connection of multiple groups" and "multiple connection of series groups." This report of the subcommittee has been accepted by the Standards Committee.

Topics in Memphis.

The electrical contractors of Memphis, Tenn., as well as central-station men in that city, are greatly interested in the program of addresses for winter meetings which has been mapped out by the Memphis Fire Insurance Club. The fire-insurance men propose to devote more than usual attention to electrical installation during the next few months, and a series of very interesting addresses has been outlined in order to acquaint the underwriters with the most important phase of their inspection nowadays. R. W. Wallace and C. F. Taylor will be the principal speakers upon electrical subjects before the Club. Mr. Wallace will talk of "Lightning and Lightning Rods: The Attitude of Fire-Insurance Companies Toward Lightning Rods," and Mr. Taylor's subjects will include the following: "The National Electrical Code." "Lamps, Cords and Sockets." "Fuse Blocks, Switches and Motor Connections." "Electrical Heating Devices." "Circuits, Overloaded, Shorted and Grounded." "Wires, Insulation, Supports, Etc.," "Motors and Generators" and "Electrolysis."

Among the Contractors.

The Palmer Electric Company, of which George W. Hill is manager, has completed an installation at the Peoria County Poor Farm, Feoria, Ill., including the power equipment, storage battery, wiring and fixtures.

It is reported that Lawrence A. Blum has secured the contract for a six-story carriage repository and garage for Robert Kinnier on West Fayette Street, Baltimore, Md.

The Dickinson Electric Wiring & Fixture Company, of Dickinson, N. D., has been awarded the contract for wiring the new Elks Home of that place, a structure which will cost $75,000. This is a conduit job throughout. The same company is just completing a "white-way" system of 84 ornamental lampposts in Dickinson. D. A. Cutnaw is manager of the company.

Samuel Gray, Baltimore, Md., has been awarded the contract for an electrical installation in the residence of Cardinal Gibbons, adjoining the Cathedral.

The Mack Electrical Company, of Owensboro, Ky., has the contract for installing an addition to the modern street-lighting system which has been begun in that city. The system will be extended to cover the entire business district of Owensboro.

L. A. Derby & Company, of Lowell, Mass., have under contract the complete wiring and fixture installation in the Young Men's Christian Association building in that town. Among other work this company has under way is included that on the Curran and the Joyce residences in Andover, Mass., the electrical equipment of each amounting to about $5,000.

After keen competition, Joseph Dreisch has been awarded the contract for the electrical work in a group of buildings for the Saint Charles College at Ellicott City, Md. The buildings will cost about $1,000,000 and the electrical contract is itself a very large one.

The Electric Maintenance Company has developed considerable importance in the electrical field of Louisville, Ky. The company, of which E. A. Prince is manager, specializes in the maintenance of motors to insure a maximum of efficiency from such equipment. When a Louisville factory owner adopts electric power permanently, one of the first things he does is to arrange with the maintenance company to inspect his equipment regularly and to insure its working in the best possible shape. When adjustments are necessary or a motor is to be rewound, the work is done before the trouble results in decreased efficiency of the plant. The work of the company aids the consumers in realizing better returns upon machinery investments and protects the central stations from early complaints which are often inevitable when a new consumer is being served.

Ohio Contractors Meet.

The Ohio Electrical Contractors' Association held a meeting last week at Dayton, O., in the Algonquin Hotel. About 20 of the 39 members were in attendance, President P. J. McNerny, of Cleveland, presiding. Among those present at the meeting was George H. Duffield, of Utica, N. Y., representing the National Electrical Contractors' Association. He was en route to the Pacific Coast on organization work.

The subject of standard markings for electrical equipment, to be incorporated in the proposed state building code, was gone over in detail, and attention called to the fact that standards of conduits and wire sizes have been prepared by the national organization and are available to the members.

A plan is being agitated by contractors to have a state examining board to pass on qualifications for electrical contractors or to have a law enacted that will permit municipalities to

avail themselves of electrical inspection rules if they so desire.

Secretary J. C. McMaster, of Columbus, stated that there are 70 members of the national association in Ohio, and an effort will be made to secure their membership for the state organization.

A New System of Electric Wiring.

An interesting attempt to reduce the cost of interior wiring has been introduced by the Western Electric Company of London, England, and it is claimed that it reduces the cost of open-wiring installations by 40 per cent. At this figure it is obviously cheaper to instal than either a conduit or a casing system. It is known as the Terroid system, the wire consisting of a principal insulated conductor of standard make to the outside of which is attached a

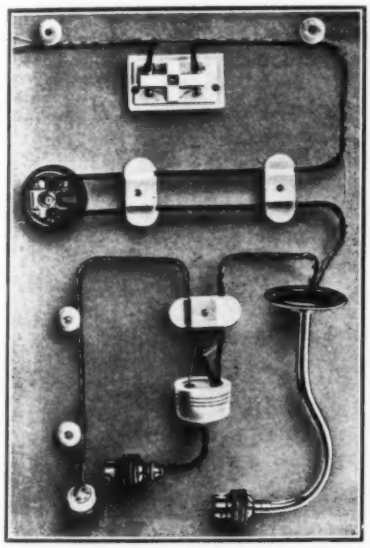


Fig. 1.—Method of Installing Fuses and Switches.

return conductor having a lower insulation or none at all, the attachment being such that the two can be readily separated for local distribution. This combined conductor costs considerably less than two insulated wires of similar carrying capacity. The electrical circuit is completed in the principal conductor, through the swithes and fuses of the lights, motors or other current-consuming devices, and back by the return or earthed conductor. This is an ingenious application of an old principle which is adopted, for example, in electric railways, where the third rail or trolley wire is insulated, the car wheels running on the return conductor.

In electric lighting on the three-wire system, the middle wire is earthed and current of 120 or 250 volts pressure returns by the middle wire. For private installation a separate bare conductor acting as a return wire was in use in some places in England more than 20 years ago. It was usually run in soft metal pipes, but frequently it was installed without mechanical protection. In either case it was liable to breakage, involving the passage of the return current through foreign paths, which sometimes produced not only a breakdown of the electric supply, but occasionally resulted in electrolytic damage. This system, however, fell into disuse before the general introduction of iron and steel conduits.

The Terroid system combines the principal and the return conductor in one cable and thus casual earthing is prevented. For conduit work the combined wire is smaller than two insulated wires and therefore the pipes which can be used are smaller and there is not so much cutting away of wood work and walls to allow the passage of the pipes. This is a most important point in interior installation work. Other advantages of the system are that no special tools are required to carry out the work and it can be used for the extension of an existing installation as easily as for a new one, and also it can be applied to either alternating or direct current, conduit or casing work or open wiring.

The importance of this development is increased by the fact that during the past few years the cost of rubber-covered cables has become so high that economy in their use means a substantial reduction of first cost. For power systems involving the distribution of heavy currents, therefore, the economy of the system above described is most marked. The return conductor can be readily cut away from the insulated wire where branches are made to switches, the bare wires being soldered together. Only single-pole fuses and switches are used and these are placed on the insulated wire as shown in Fig. 1. Behind fuse boards and main switchboards it is very convenient practice to connect all return wires together on a strip of metal or busbar as shown in Fig. 2. If current-carrying parts are exposed behind fuse boards, care must be taken that the bare wire cannot cause a short-circuit.

Method of Grounding On Byllesby Lines.

All of the Electric companies operated by H. M. Byllesby & Company will follow a uniform method of grounding secondary circuits of 250 volts or less. The ground connection is to be made at the transformer and never within the building of the customer.

A circular letter issued by P. G. Hunt, of H. M. Byllesby & Company, under date of November 4, says:

"All managers of the Byllesby properties doing an electric light and power business, who have not already made a practice of grounding secondary circuits of transformers, are herewith requested and authorized to make proper and workman-like ground connections on secondary circuits of transformers, where the voltage of such circuits does not exceed 250 volts.

"All ground connections will be made at the poles where the transformers are installed, and not within the buildings of the customer, nor shall the service switch either on the customer's side or the service side be connected to ground.

"Where secondary circuits are carried over 1,000 feet from the service transformer, ground connection will be made on same every thousand feet of length of the secondary line.

"The ground connection will be made by driving into the ground at the base of the pole a 0.75-inch galvanized iron pipe at least five feet, and more than five feet if permanent moisture is not obtained at the depth of five feet. To

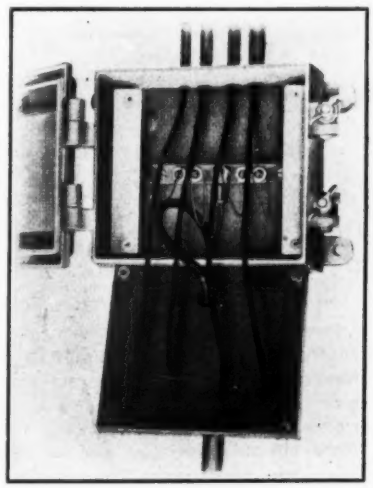


Fig. 2.—Connections of Return Wires.

the top of this pipe will be secured, by means of babbitt metal poured into the pipe and extending therein eight inches, one piece of No. 6 gauge, BB puddled iron wire; connections between which and the transformer secondary circuit will be made by extending this wire up the poles, properly secured at intervals of three feet by staples. This wire will be protected against injury for a heigth of seven feet from the ground by means of a heavy piece of molding nailed to the pole over the wire.

"All single-phase, two-wire secondary circuits shall be connected to the ground on one side of the circuit. All secondary, three-wire circuits shall be connected to the ground from the neutral wire of this circuit. On all multiphase, secondary circuits ground connections shall be made to the neutral point of the phase connections."

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Fishing Wires in Large Conduits.

I read some time ago in a wiring kink about fishing wires in pipes by means of loops of cord on the end of a steel snake. I have been doing that in small pipes, but in large ones it takes some time to get the loops caught in the hook of the snake. Therefore I always use tie wire that I get from the lathers. I make four or five loops and tape the wire on the snake. When I push this in to fish the other snake, the loops of tie wire do not double up like loops of cord, but they pretty nearly fill the pipe and are quite easily caught on the hook on the end of the steel tape which is being pushed in from the other end of the conduit.

Henry Fleishman.

Tool for Installing Annunciator Wires.

In the issue of October 26, C. Nolte described the use of an umbrella rib for drawing annunciator wires through holes in studs, etc. While an umbrella rib takes up very little room, every little bit of room that can be saved in the tool kit makes it that much more convenient. I think the following handier than the device recommended by Mr. Nolte.

I draw the temper from the end of a long feeling bit and drill a small hole

Fig. 1.—Bit Ready for Use.

near the end and then harden the bit again. After boring a hole I loop my wire through the hole in the end of the bit and as the bit is withdrawn from the wood the wire is pulled through after it. The bit may also be used to draw wires through holes already bored.

Edward J. Tracey.

Handy Arrangement of Test Lamps.

We formerly had our testing cords lying about on the work bench, and when we wanted to use them we generally had to dig them from under tools and other things on the bench. The other day, however, I put on a longer cord and hung it to the ceiling so that the cords hung down at the back side of the bench. Now it is always handy, and we never find the test lamps burning because the cord tips have gotten together or are both touching some piece of metal. Fig. 2 illustrates the arrangement we have adopted. The dotted line represents

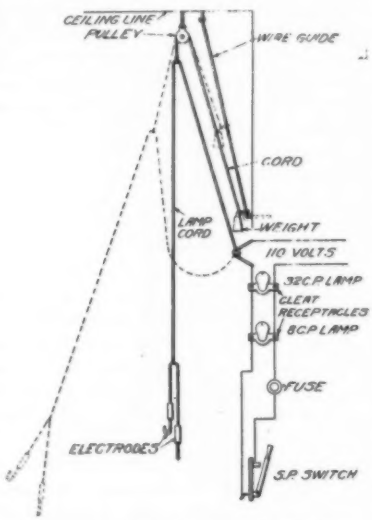


Fig. 2.—Cords and Lamps in Position.

the flexible cord pulled into a lower position than it ordinarily hangs.

The test cord hangs on a string and is balanced by a weight, and the weight, in turn, slides on an iron-wire guide, so that the weight does not swing about and get mixed up with the test cords. Thus the cord is not only kept out of the way when not wanted, but a cord of sufficient length can be used to reach a motor or other piece of apparatus on a block near the bench or on the floor.

We use two lamps in cleat receptacles, one an 8-candlepower lamp and the other a 32-candlepower lamp. If we wish to protect against too much current in making a test, we reach up and unscrew the larger lamp. If we wish to use the full strength of the current without any resistance in series—for instance to test out a fan motor after being satisfied that it is ready to run—we cut the cords directly on to the line by closing the single-pole switch illustrated. This cuts in the line through a fuse also placed in a cleat receptacle as shown. The cord-tips, or electrodes, are made by soldering pieces of No. 8 copper wire to the ends of the cords, and then winding on some tape for handles. As illustrated, one of them is longer than the other, so that they will not short-circuit. One has a hook on the end so that it can be hooked onto a contact of the article being tested while with a free hand the electrician tests with the other tip.

C. W. Goddard.

Unusual Scheme for Pulling Wires Into Underground Conduit.

Not long ago I had to pull two No. 10 rubber-covered wires out of a run of bituminized fiber conduit laid three feet underground. The total length of the run was 127 feet and the size of the pipe was 1.25 inches. The two ends were at cutouts and switches on opposite sides of the street, as shown in Fig. 3. It was desired to replace the two No. 10 wires with a pair of No. 4 rubber-covered conductors.

I found I could not even start the two wires out. So I came to the conclusion that the compound which was used in the conduit joints had melted and run through the joints on top of the wire and cemented

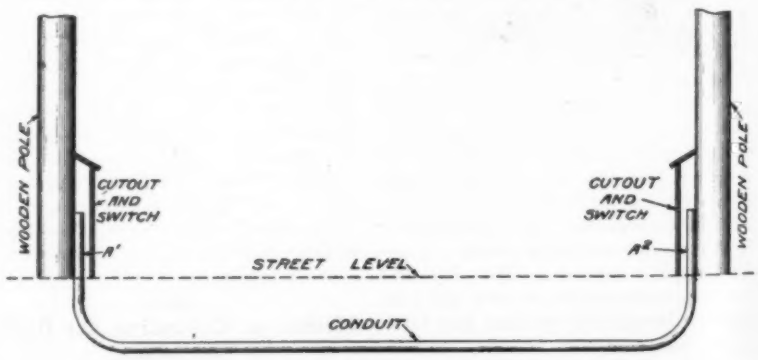


Fig. 3.—Circuit Which Gave Trouble.

them fast. To clear the trouble I short-circuited the No. 10 wires at one end and put 75 amperes of current through the line, using a water rheostat on one side of the line to reduce the pressure from 110 volts. In 15 minutes it heated the No. 10 wires so that I could pull in the two others, which I attached to the ones to be removed, and pulled the new circuit in as the old one was being pulled out.

Harry H. Matheson.

Among the Supply Men

Electrical Supply Jobbers' Meeting.

A very happy and successful meeting of the Electrical Supply Jobbers' Association was held at Hot Springs, Va., November 13, 14 and 15. Headquarters were established at the Homestead Hotel, and a number of sessions at which many important items of interest to the jobbers of the country were thoroughly discussed, were held.

The question of the place of the February meeting of the Association brought out a great deal of discussion, and the majority of those present favored the engaging of a large boat of one of the transportation companies to take the entire party to Panama. This matter was referred to a committee to investigate the feasibility of such a plan and report later.

The entertainment features were many and varied, and all those present had a most enjoyable time.

The games included contests for the jobbers and manufacturers on the golf links, putting contests for the ladies, bridge and "five hundred" for the ladies, tennis singles and doubles, and a pool and billiard tournament for the men. The point to point riding race, a leg of which has been won by Colonel W. N. Pelouze of Chicago, was postponed. There were over 30 prizes, donated, respectively, by the Westinghouse Electric & Manufacturing Company, the General Electric Company, the Thomas & Betts Company, W. W. Low, American Electric Heating Company, W. N. Matthews & Brother, and by the Electrical Supply Jobbers' Association.

The prizes for the jobbers' golf tournament were won, respectively, by Messrs. Millner, Philo, Little, Oberlander, Havens and Seabury. The prizes for the manufacturers' golf tournament were won, respectively, by Messrs. Despard, Corey and Anschutz. The prizes in the ladies' putting contest were won by Mrs. Downs, Mrs. Price and Mrs. Rockafellow. The ladies' "500" prizes were won by Mrs. Tonkin, Mrs. Ward, Mrs. Lillie, and Mrs. Anschutz. The ladies' bridge prizes were won by Mrs. Low, Mrs. Adams, Mrs. Rockafellow, Mrs. Burton. The raffle was won by Mrs. Tonkin. The trophy in the pool tournament was won by W. T. McCullough, the billiard trophy was won by Fred Fullerton, and the tennis tournament by A. Hall Berry.

There were a great many of the manufacturers who had attended the meeting of the Electrical Manufacturers' Club the week before who stayed over for the meeting of the jobbers' association, and these greatly augmented the list of attendants. Among those present were the following:

H. C. Adams, Pawtucket; W. L. Adams, Providence; S. H. Anderson, Pittsburgh; L. F. Anschutz, Providence; F. B. Adams, St. Louis; H. P. Andrae, Milwaukee; M. B. Austin, Chicago.

A. E. Beling, Pittsburgh; J. H. Burns, Buffalo; E. G. Bernard, Troy; J. B. Baker, New York; F. C. Barrington, New York; T. E. Burger, Los Angeles; W. J. Burns, Jr., Wheeling; C. E. Browne, Chicago; E. Bartram, Philadelphia; W. H. Bauer, Chicago; F. A. Burke, Atlanta; F. S. Baldwin, New York; F. M. Bernardin, Kansas City; D. R. Bullen, Schenectady; F. V. Burton, Bridgeport; A. Hall Berry, New York; Frank Brookfield, New York; W. F. Bissell, Toledo; P. F. Bauder, Cleveland; Julien Binford, Jr., Richmond; A. W. Berresford, Milwaukee.

George Cutter, Washington; R. B. Cressman, Philadelphia; James Clark, Jr., Louisville; A. J. Cole, Chicago; R. E. Campbell, Cleveland; A. M. Collins, Cleveland; Oscar Carman, Indianapolis; C. M. Crofoot, Cincinnati; N. C. Cotabish, Cleveland; H. H. Cudmore, Cleveland; M. F. Cronin, Chicago; Walter Cary, New York; G. A. Cragin, Worcester; C. E. Corrigan, Pittsburgh; LeRoy Clark, Englewood; Le Baron C. Colt, Bristol; R. B. Corey, New York; H. B. Crouse, Syracuse; J. Robert Crouse, Cleveland; S. B. Condit, Jr., Boston; S. A. Chase, Pittsburgh; E. P. Clifford, New York.

L. O. Duclos, Boston; W. M. Deming, Schenectady; F. L. Dunbar, Bristol; P. S. Dodd, New York; W. J. Doherty, Montreal; B. B. Downs, St. Paul; A. E. Durin, Cedar Rapids; D. W. Daily, Cleveland; T. M. Debevoise, New York; L. N. Downes, Providence; B. M. Downs, New York; J. W. Demich, Philadelphia; V. R. Despard, Chicago.

A. P. Eckert, New York; R. Edwards, Jr., New York; J. B. Estabrook, Warren; F. A. Estep, Pittsburgh; G. W. Elliott, New York.

F. R. Fortune, Pittsburgh; F. D. Fullerton, New York; H. C. Farnsworth, Boston; Leon H. Franks, Wheeling; J. M. G. Fullman, Pittsburgh.

J. M. Griffin, Schenectady; W. M. Gloeckner, Philadelphia; Edward R. Grier, Hartford; A. C. Garrison, St. Louis; H. L. Grant, Chicago; H. J. Gorke, Syracuse; Thomas G. Grier, Chicago; H. S. Greene, Cleveland; L. Griesser, Cleveland; G. B. Griffin, Pittsburgh; R. E. Gorton, Warren; G. C. Griffing, Milwaukee; L. V. Garron, Philadelphia; A. A. Gray, Chicago.

B. D. Horton, Detroit; F. M. Hawkins, New York; C. L. Hight, New York; H. H. Hornsby, New York; J. H. Hughes, New York; E. E. Hudson, Orange; E. H. Haughton, Chicago; C. R. Hunt, Chicago; W. R. Herstein, Memphis; H. W. Hall, Richmond; C. A. Harding, Chicago; A. L. Hawse, Richmond; C. B. Hawley, Salt Lake City; N. G. Harvey, Chicago; W. H. Hopkins, Columbus; J. W. Ham, Schenectady; E. B. Hatch, Hartford; R. G. Hemingray, Indianapolis; C. I. Hills, Hartford.

E. M. Jones, Philadelphia; J. G. Johannesen, Baltimore.

W. B. Kinkead, New York; H. B. Kirkland, Pittsburgh; L. H. Keleher, New York; Frank Kuhn, Detroit; B. C. Kenyon, Plainfield, Robert Kuhn, Detroit; P. S. Klees, Hartford; F. A. Ketcham, Chicago; Chas. Kuhn, Cincinnati; L. W. Kittman, Chicago; H. W. Kilkenny, Schenectady.

C. J. Litscher, Grand Rapids; A. W. Lindgren, Duluth; W. F. Lewis, Pittsburgh; W. W. Low, Chicago; L. A. Landau, New York; R. W. Lillie, Boston; G. G. Lockwood, Providence; Arthur Lockwood, New York; A. M. Little, Syracuse; H. C. Lucas, Philadelphia; Max Loewenthal, New York; N. L. Loveland, New York; C. W. Loveridge, New York.

T. S. McLean, Bridgeport; H. P. Moore, Newburyport; F. D. Masterson, Boston; C. S. McKinstry, Cleveland; C. G. McGreevy, Syracuse. W. J. Mayo, Richmond; Max McGraw, Sioux City; E. B. Mallory, New York; D. H. Murphy, Pittsburgh; J. H. McGill, Valparaiso; L. T. Millner, Cincinnati; A. L. Millard, Chicago; W. N. Matthews, St. Louis; W. N. Merrill, Chicago; W. G. McKitterick, Cleveland; J. R. McNaughton, Detroit; W. H. Merril, Chicago; W. T. McCullough, Pittsburgh; R. M. Morris, Pittsburgh.

J. F. Newcomb, Boston.

M. A. Oberlander, New York; H. C. Owen, Baltimore; James B. Olson, New York; Franklyn Overbagh, Chicago; G. C. Osborn, New York.

J. P. Provost, Pittsburgh; D. T. Pierce, New York; J. A. Pizzini, New York; L. F. Philo, Buffalo; W. T. Pringle, Philadelphia; H. E. Page, Hartford; C. McKew Parr, Hartford; G. L. Patterson, New York; J. D. Presbrey, Cleveland; R. H. Phillips, New York; H. T. Paiste, Philadelphia; F. S. Price, Boston; A. H. Pease, Hartford; J. W. Perry, New York; A. D. Page, Newark.

C. Russell, Albany; Warren Ripple, Chicago; James Richardson, Minneapolis; W. E. Robertson, Buffalo; J. D. Robertson, Buffalo; S. O. Richardson, 2nd, Toledo; S. O. Richardson, 3rd, Toledo; C. W. Ridinger, Pittsburgh; E. W. Rockafellow, New York.

Henry D. Sears, Boston; Frank Stout, Plainfield; Henry Schroeder, New York; E. M. Scribner, Chicago; A. J. Selzer, Chicago; E. A. Seabury, Omaha; S. O. Schwab, Chicago; W. H. Seldon, Jr., Detroit; F. F. Skeel, Chicago; G. S. Searing, Chicago; W. S. Sisson, Providence; C. C. Sibley, New York; B. E. Salisbury, Syracuse; B. H. Scranton, Detroit; A. J. Sondheimer, Schenectady; Eugene Smith, Cincinnati; Robert Simms, Jacksonville; A. W. Stowe, Schenectady; Gerard Swope, New York; Herbert Sinclair, Trenton.

A. S. Terry, Cleveland; W. T. Thomas, Philadelphia; W. J. Tonkin, Providence; J. H. Trumbull, Hartford; G. L. Thompson, Philadelphia; W. M. Tenney, Chicago; T. L. Townsend, Washington; F. B. Thompson, St. Paul; R. O. Troy, Schenectady; F. S. Terry, Cleveland; F. Tresselt, New York; F. W. Tillinghast, Providence.

F. B. Uhrig, Kansas City.

J. A. Vaughan, Philadelphia; F. L. Van Winkle, Cincinnati.

E. J. Wallis, Atlanta; L. A. Woolley, Buffalo; C. F. White, Boston; T. G. Whaling, New York; J. F. Walsh, New York; J. A. Worth, Milwaukee; C. D. Wilkinson, Minneapolis; H. L. Walker, Detroit; A. E. Williams, Warren; H. E. Watson, Chicago; I. R. Watts, Cleveland; H. R. Worthington, Jacksonville; W. C. Wing, Cleveland; Joseph Wolff, Chicago; W. Weiss, St. Paul; J. E. Way, New York; J. M. Woodward, Cleveland; Bruce Wetmore, Boston; C. H. Wilcox, New York; F. E. Watts, New York; J. B. Ward, Boston.

S. R. Yundt, New Orleans.

The Northwestern Electric Equipment Company, St. Paul, Minn., is conducting a Christmas campaign on "Hot-Point" heating devices, the Bissell and Premier cleaners, and other specialties. The company has adopted a slogan "When Christmas is Electrified Every-

body's Satisfied. Have an Electric Christmas." One of the features of this campaign is a striking colored poster showing two immense incandescent lamps in a wreath of holly, advertising the aforementioned slogan. The company reports a general increase in business throughout the territory with a special demand for Fostoria Mazda lamps. J. M. Whalen has been elected vice-president of the company, succeeding R. D. Thompson, deceased.

B. B. Downs, president of the St. Paul Electric Company, St. Paul, Minn., has just returned from a two weeks' trip in the east and reports business generally good and better than last year.

A report from the Protective Electrical Supply Company, Fort Wayne, Ind., indicates that although it is conducting no special sales campaigns, the salesmen report good business from all over the territory. The wiring department is receiving special demands from contractors and dealers.

The Monarch Electric and Wire Company, Chicago, Ill., reports that it is conducting a special campaign on its weatherproof wire known as "The wire with the tag," and suggests that buyers should get its prices on this high-grade material before purchasing.

The Railroad Supply Company, Chicago, Ill., reports very good business in the Middle West, and the company is experiencing special demands for highway crossing alarms for both steam and electric railroads.

Legal Notes

PRECAUTIONS TO BE USED WITH RESPECT TO HOUSE-MOVING.

By Maguire and Mooney.

No one has an inherent right to move buildings in public streets, but permission may be granted by local authorities. The duties of a public-utility company in such cases depend upon the terms of its franchise, and existing laws and ordinances. Where the duty lies to remove wires temporarily, compensation must be made by the house-mover.

While the moving of buildings through streets may not be as frequent in large cities as it is in smaller ones, it nevertheless is a factor at all times for electric power companies to contend with. And in a few novel decisions the rights of the company, the house-mover and the public have been considered.

It is always interesting to know just what must be looked ahead for in erecting wires and poles. The same problems with different phases confront all quasi-public companies. And, to be sure, the electric company may be the one least annoyed by house-moving, yet its service can be disarranged and much trouble given it.

No one has an inherent right to move buildings in public streets—it is ordinarily a privilege granted by the proper authorities of the city. This privilege is never granted to those who desire to move buildings in the main centers of large cities for one reason at least—the inconvenience and annoyance to so many. Accordingly, it is not necessary to conjure pictures of the destruction caused by buildings being moved through the principal streets of a large city. However, even if such were possible, it could rarely affect an electric company, as in such places the wires are ordinarily in conduits.

If the privilege of moving houses upon public streets is to be given at all it should be limited to those who make that their business; otherwise incompetents would clutter up the streets with their bungled efforts. And then it is no more than proper that the city require a good bond for the careful performance of the work.

It was contended in Fort Madison Street Railway Company vs. Hughes, 114 N. W., 10, that house-movers had a right to move a building along a public street. Hughes had contracted to move a building 21 feet high, but the company operated a street-car line on the street on which it had to be moved, and the wires were so strung that they would have to be removed before the house could be moved. Hughes notified the company that all stay, trolley and other wires would interfere and obstruct the passage of the building and ordered the company to remove the wires as fast as possible. The company sued for an injunction to prevent interference with its wires. The court held that the company was required by law to move its cars at frequent intervals and that its facilities for rapid and convenient transportation had been established at large expense, and the value thereof ought not to be unduly impaired or the carriage of passengers interrupted by obstructions in the streets for any considerable time. Hughes proposed to move the house along and upon the street for some lengthy distance, thereby not only stopping the running of the company's cars for several days but also requiring the removal of its wires as well. The court held that he had no right to interfere with the wires or to interfere with the operation of the street cars, and therefore granted the injunction.

Some courts have laid great stress on whether the company had its wires the proper height required by ordinance. In New Jersey (New York & New Jersey Telephone Company vs. Dexheimer, 14 N. J. L., 295) the permission of the Common Council to move a building along a certain street was held to be a justification for cutting telephone wires which were not as high above the level of the street as the ordinance required. The better rule, it seems, will not permit this. In one case it was claimed that the ordinance required the wires to be not less than 22 feet from the ground, whereas they were as low as 14 feet and the building to be moved was more than 14 feet but less than 22 feet. The company refused to raise the wires on request and the movers threatened to go ahead anyway and tear down all wires that came in contact with the building. An injunction was obtained, and the question of the height of the wires did not seem to have any bearing on the decision. The court held that the moving would disturb the right of the public and interrupt the traffic on the street.

There are some conditions that nevertheless require the electric company to submit to the annoyance of house-movers. It has been held that it would be a reasonable requirement on the part of an electric railway company that houses shoulld be moved across its tracks only in the night-time, both for the protection of the public from any danger which might be involved in the removal or disconnection of the wires at a time when the current was on, and also to avoid

injury to the company by the interruption to its travel and the inconvenience of passengers. But under any circumstances if an electric light company, at the request of a house-mover, removes and replaces a wire which it has erected in accordance with an ordinance, it is entitled to recover whatever the services are reasonably worth. And if the house-mover failed to request the removal of the wires, but removed them himself, he would be liable in an action for damages. An electric company is under no obligation to remove and replace wires for anyone without compensation. In this respect Massachusetts has a peculiar rule. Where one has obtained proper permission from the proper authorities to move a building he may, after giving the required notice to the company, cut and remove all obstructing telephone, telegraph, heat, power and electric light wires, except wires which supply heat or power for street railway companies.

In the case of Weingarner vs. Edison Electric Light and Power Company, 109 Pac., 778, it was held that it was the duty of an electric light and power company having wires charged with a high voltage of electricity, suspended upon poles across a street in a city, upon which street the moving of a building of greater height than the wires is reasonably to be anticipated, to insulate the wires at such crossing, or to take such other precautions as are necessary to protect any person who is liable to be upon such building and to be brought in contact with such wires. This decision puts a new phase on the matter. Here is a concrete illustration of how an electric power company is liable for injuries in this manner. However, under this decision, it appears that it was the law of the State (Kansas) that the company's business was subject to regulation by the city, and when a license was issued to the house-mover it was the company's duty to see that he was not injured, at least in so far as proper insulation would protect him.

While this is the first case where a house-mover was killed by coming in contact with the wires of an electric power company, nevertheless the rule therein laid down arose in a number of cases where travelers were passing over highways and were injured by sagging wires. It is the duty to protect the wires or so insulate them as to guard against accident to all who have any business in close proximity to them. For these reasons the company should have anticipated not alone house-movers, but men who might be working on other systems, or whose business would bring them in close connection with the power wires. It has been repeatedly held that companies are guilty of negligence when they place their wires only a little way above the head of a person and then permit such wires to become slack and to sag until they interfere with legitimate travel. And unless the wires are at all times the required distance above the ground then the company is subject to liability in case of injury. To show, however, that the courts do not believe that the duty rests upon electric companies to deal with the employees of other companies in the same manner as they deal with the general public, the case of Lundy vs. Southern Bell Telephone Company, 72 S. E., 558, may be cited. Charles Lundy, an employee of the City of Columbia, was arranging to connect wires of the city with the poles of the Southern Bell Telephone Company. When Lundy was on one of the poles he came into contact with a wire or wires of the company that had been permitted to cross the wires of the Columbia Street Railway Light & Power Company, and on which insulation had worn, and as a result he was killed. The judgment in the lower court was for $20,000, but on appeal the judgment was reversed on an error of the lower court. The attitude of the court showed that it was not disposed to uphold such a verdict. Lundy was an experienced lineman, and could with reasonable care have protected himself. It is not the duty of the company to keep its wires perfectly insulated nor to use the utmost care when dealing with experienced linemen.

There is a seeming conflict in the decisions of some of the courts, but this arises mainly on account of the interpretation of local laws. It is agreed by all that the moving of buildings through the streets of a city is a privilege and not a right. For this reason municipalities have the right to reasonably regulate this. Now the relation of the electric company to the mover varies a little. It depends to a great extent upon the franchise given to the company. The extent of the franchise determines the power of the municipality to grant permits to movers with authority to remove wires.

Inasmuch as the question of the right of the company to maintain its wires on streets has been discussed to some extent in connection with house-movers, it might be well to go further and determine, when, if ever, wires may be removed, or ordered removed. The case in which this precise question arose is Butler vs. Frontier Telephone Company, 186 N. Y., 486. The company had stretched wires across premises owned by Butler, but the supports for the wires were not upon his land at all. The question presented was whether an action would lie when the soil is not touched, but part of the space above the soil is occupied by a wire unlawfully strung across it. The court held there could be no distinction because it was only a small wire; if it had been a huge cable there would have been a difference in degree, but not in principle. The court in this case held that the surface of the ground is a guide, but does not constitute the full measure of real property; that anything that encroaches upon the space above the ground is an occupation of that space and should be removed.

In Wandsworth District vs. United Telegraph Company, 13 Q. B., 905, it was held that the local municipal authority could not procure an injunction against the maintenance of telegraph wires which were stretched over a street where the wires were, with the consent of the owners, attached to buildings on the opposite sides of the street, and were strung at considerable height, and created no appreciable menace to the safe use of the street. The court, however, held that if they were put there without license they constituted a nuisance and should be removed, but held that an injunction against their maintenance was not the proper method of procedure in such cases as this.

Interesting Cases.

RAILWAY TAX.—The Circuit Court has handed down a decision in five cases against the United Railways Company, of St. Louis, Mo., declaring it must pay the city $1,100,000 plus interest claimed by city under the mill-per-passenger tax ordinance.

BELL COMPANY WINS.—The United States Supreme Court has dismissed for want of jurisdiction the suit of the National Telephone Manufacturing Company of New Hampshire for $500,000 damages for alleged malicious prosecution by the American Bell Telephone Company of Massachusetts. No damages were recovered in the court below.

NOT A PUBLIC UTILITY.—The Supreme Court of Wisconsin held, in the case of Cawker vs. Meyer, that a building owner does not come within the meaning of a statute constituting every one a public utility who shall furnish heat, light or power to the public, by furnishing heat, light and power to his own tenant and selling the surplus to three neighbors.

AGREEMENT FOR PERCENTAGE OF EARNINGS INVALID.—The Supreme Court of Errors has found against the city of Waterbury in sustaining the decision of the Superior Bench that the Connecticut Company, the New Haven road's trolley corporation, could not be held to the agreement which the old Waterbury Traction Company originally made to pay the city 2 per cent of its gross earnings and two per cent of any excess over six per cent on the capital stock. The case has been in the courts for over five years. It grew out of the condition imposed upon the Waterbury Traction Company when it secured its charter in 1893.

Public Service Commissions

WISCONSIN.

As a result of an investigation by the Wisconsin Railroad Commission on its own motion, the Chippewa Valley Railway, Light and Power Company has been ordered to amend its rate schedule in the city of Eau Claire, in so far as it appertains to the classification of lamps, by substituting a reclassification devised by the Commission. It appears from the complaints and from the investigation of the Commission, that the electric company has made it a practice to discriminate between consumers using electricity exclusively and consumers using both gas and electricity, in the matter of the classification of lamps into active or non-active lamps. This condition of affairs is the result of active competition between the defendant and the Eau Claire Gas Company, in which the former sought to compel the exclusive use of electricity in cases where gas consumers desired to make use of a limited number of lamps for sign or convenience purposes, by rating all lamps so used as active lamps. To eliminate all causes of complaint on this score, the Commission ordered all lamps to be classified according to one of two methods. The first method is the same as the Commission has used in previous cases, namely, a classification according to the nature of the business in which the lamps are used. In class A, consisting of residences, 60 per cent of the connected load up to 500 watts and 33.3 per cent of the excess is to be regarded as active; in class B, consisting of mercantile establishments, banks, offices, etc., 70 per cent is to be active; in class C, consisting of hotels, small factories, warehouses, etc., 55 per cent is to be active; in class D, consisting of opera houses, churches, etc., 40 per cent is to be active; in class E, consisting of signs and window lights, 100 per cent is to be active. In the second method, the residence lights are classified as active or non-active according to the room in which they are used.

The rate for incandescent lighting comprises a readiness-to-serve charge of 15 cents per month per active lamp of 50 watts capacity and an energy charge of 3 cents per kilowatt-hour. In the case of sign lighting, the readiness-to-serve charge is to be 5 cents per month for each lamp in the sign.

The gas company, also a party in the case, complained of the practice which the electric company followed, of refunding 25 per cent of the cost of equipment to any consumer purchasing such equipment under specified conditions and under a three-year contract for power. This complaint was dismissed on the ground that a utility in active competition with another is entitled to use any method of obtaining new business that it wishes, provided that in so doing it does not discriminate between consumers and does not sell its commodity for less than cost.

The Duluth Street Railway Company has been ordered by the Commission to sell six tickets for 25 cents for use on its lines in the city of Superior. The complaint in the matter was submitted to the Commission about two years ago by the Superior Commercial Club, which alleged that the straight five-cent fare was excessive in that it enabled the defendant company to enjoy a high rate of return upon its investment in the city of Superior. After a thorough investigation of the case, the Commission concluded that the defendant was entitled to earn interest upon an investment of approximately $740,000, or a sum about equivalent to the cost of the property new. This value is about $255,000 higher than the value alleged by the petitioner and about $120,000 less than the value claimed by the defendant. With the Commission's valuation and a depreciation reserve computed on a 2-per-cent sinking-fund basis, the excess of net revenue over a 7.5-per-cent rate of return was approximately $13,000, for the year ending June 30, 1912. On this showing, the Commission considered that a reduction in fares was justifiable. It was pointed out, however, that a reduction in rates would not necessarily mean an equivalent reduction in net revenues, for experience has shown that a reduction in rates is invariably accompanied by a marked increase in business. In determining the valuation to be used as a basis of rates, the Commission could not see its way clear to include the value of certain real estate which was donated to the company for a private right of way and which the company contended should be considered as a part of its valuation. It was held that the public should not be expected to pay interest upon property originally donated for public purposes. In reply to the contention that a five-cent fare was the common practice on traction systems, the Commission called attention to the fact that the rates which were ordered by it were always determined by the cost of performing the service involved. Facts were presented, however, to show that more than one-third of all the operating companies in the United States offer fares of less than five cents to all patrons, and that about 25 per cent offer rates of slightly more than four cents. Six tickets for a quarter was found to be common practice and the rates filed with the Commission by the urban companies in Wisconsin show that, out of 18 companies operating in the large cities of the state, 15, or 83 per cent, have rates below five cents.

To enable the Lancaster Light and Power Company to acquire the property of the Lancaster Electric Light Company, to pay its outstanding indebtedness and to provide for extensions to its property, the Commission has authorized the issue of $100,000 par value of 5.5-per-cent bonds and $25,000 par value of common stock. The Baraboo Gas and Electric Company has been empowered by the Commission to issue $125,000 of six-per-cent bonds.

OHIO.

The Public Service Commission has authorized the New Knoxville Electric Company to issue capital stock of the par value of $8,000 to purchase material for the erection of a transmission line from Moulton to New Knoxville and a distributing system in New Knoxville.

The Cleveland Electric Illuminating Company has been authorized to purchase the stock of the The Power and Light Building Company to the extent of $210,000. This is in lieu of the expenditure of the sum stated for the construction of a substation and office building, as authorized on January 20.

The Ohio Traction Company was authorized to sell its bonds, the issue of which was previously approved, at 96 per cent of their par value. This issue amounts to $750,000 and is secured by a first mortgage.

MARYLAND.

Briefs in the gas and electric rate cases, instituted by the Mayor and City Council of Baltimore against the Consolidated Gas, Electric Light and Power Company, which have been before the Public Service Commission of Maryland for a year, have been filed, and argument of the counsel begun. A decision from the Commission may be expected early in January.

The case is the most important heard by the Commission since it was created, and is regarded as one of the most important gas-rate cases ever heard before any commission in this country. Hearings have been going on all summer and more than 5,000 pages of testimony have been taken in the case. The corporation is now charging 90 cents per 1,000 cubic feet for gas and its primary rate for electricity for lighting purposes is 10 cents a kilowatt-hour. A. C. Ritchie, the people's advocate, in his brief asks for 70-cent gas and 7-cent electricity. The counsel for the gas company insists that the present rates are fair and ought not to be disturbed, that the capitalization of the company is just and that nothing should be done to disturb the present status of the company's securities. The company declares its willingness to have adopted a sliding scale by which, in future, the prices of gas and electricity may be decreased as dividends increase, but insists that the sliding scale shall have for its base prices those now in effect.

The briefs are voluminous documents, and those who have seen them say they constitute the most exhaustive and comprehensive treatises on price regulation by commission ever printed.

Mr. Ritchie's contention for 70-cent gas and 7-cent electricity is based on the statement that in the securities of the company, aggregating $43,518,088, there is $16,630,971 of water. In other words the extent to which the securities represent no investment is at least sufficient to embrace all of the common stock, $7,800,034; all of the preferred stock, $6,360,054; and $2,470,883 of the general-mortgage 4.5-per-cent bonds. He states his belief that the capitalization is inflated to an even greater extent than this. The presence of this water in the securities of the company requires an annual charge upon the people for interest and dividends of $882,794. If two-thirds of this amount were applied to the reduction of gas rates and one-third to the reduction of electric rates, Mr. Ritchie figures that 17 cents would come off the price for gas and 2.7 cents off the primary rate for electricity. That is to say, that if the company's capitalization did not contain nearly $17,000,000 of inflation, the price of gas would be 73 cents per 1,000 cubic feet and the primary rate per kilowatt-hour for electricity would be 7.3. The admitted inflation over the par value of outstanding securities, which resulted from the 1905-6 consolidation, is $6,339,070, which alone results in an annual charge upon the people of $298,758. The company's engineers, Ford, Bacon, and Davis, estimated that to reproduce the plant of the company new would cost $28,022,602, while James B. Scott, accepting the base costs used by Ford, Bacon and Davis and revising them only to the extent of not allowing a second time any overhead charges which the base costs already contain, put the cost of reproduction at $19,189,581. He estimates the present value of the company's plant after deducting depreciation at $15,890,577. It is argued by Mr. Ritchie, that if the company's capitalization represented only this value and the return was seven per cent, then, applying the rule of two-thirds of the difference between such returns and the present net earnings of the company to the reduction of gas rates and one-third to the reduction of electric rates, it would put the price of gas at 64 cents and the primary rate for electricity at 6 cents. Figuring, however, upon allowing the company upon what he considers the present plant value of $15,890,577 a return sufficient for annual reserve and interest on all bonds, the price of gas would be 70 cents and the primary rate for electricity would be 7 cents. Mr. Ritchie figures that the present cost to the company of gas at the meter is 41.47 cents, while the cost to the company of electricity is 1.5 cents. He also shows that there has been a net increase in the company's earnings for 1912 of $980,460 over the earnings of 1908, this being after the 10-cent reduction in the price of gas was made in 1908; so that he calculates that the price could be reduced 29 cents below the price of today and still leave the company with the net earnings of 1908.

The surest way to make possible future reductions, counsel for the company asserts, is to preserve and increase the credit of the company so as to enable it to borrow money on the most favorable terms, thus insuring new capital for extended public service. Conversely a present reduction in rates would impair the credit of the company, make difficult and costly the securing of new capital, and preclude any reasonable probability of further reductions for many years to come. The policy of the company in the past has been to make voluntary reductions in rates as fast as possible. Its policy in the future will be the same. The best method of carrying this out is through the operation of a sliding scale, authority for which is expressly given in the Maryland law. The company is willing to consider with the Commission such a sliding scale for the automatic adjustment of charges for gas and electricity and the dividends to be paid to the company's stockholders; this scale to be on the basis of the present rates for gas and electricity and the present rates of dividends as the starting point; and the principle of automatic adjustment being a division between the public and the stockholders of the company of the future surplus earnings of the company.

OKLAHOMA.

Attorney General West has filed a formal motion with the Corporation Commission to require the Pioneer Telephone Company to make an accounting of the charges collected in Oklahoma City under its increased rates made in 1909, which the Supreme Court recently declared illegal, and to pay it in to the Commission for distribution to the subscribers. The Company in its turn presented a request that the Commission make a thorough investigation of the reasonableness of the rates charged in Oklahoma City before proceeding to enforce the order of the Supreme Court.

OREGON.

By a bill which was adopted by the popular referendum on November 5 the Railroad Commission of Oregon is given power to regulate all public utilities of the state. This law was passed by the legislature in the spring of last year, but its operation was delayed by referendum petition. It goes into operation at once. The Commission is given power over service, rates, accounting, etc. Appeals from it can be made to the circuit courts of the state and from them to the Supreme Court. The present members of the Railroad Commission are C. H. Aitchson, T. K. Campbell and F. J. Miller.

COLORADO.

At the recent election in Colorado, two bills affecting the public utilities of the state were put on the ballot for the approval of the voters, but each was defeated. One of the bills, introduced by the Direct Legislative League of Denver, provided for the establishment of a Public Utilities Court; and the other, known as the Public Utilities Act, was backed by the Denver Trades and Labor Assembly. Each provided for a public service commission. The former measure was defeated on election day by a majority of 7,183, the vote being 10,942 in favor of it and 18,125 against its adoption; and the Labor Bill was rejected by a majority of 10,839

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 102.—Fenders for Automobiles.—The City Council is considering an ordinance requiring all automobiles, electric as well as gasoline or steam, to have fenders. While it is true that fenders on street cars running over a smooth track have been instrumental in saving life, I believe that it is not at all feasible to use a fender on an automobile which must run over rough pavements, through ruts and over other obstructions that would very quickly crush a fender and possibly cause a serious accident to the automobile and its occupants. Has an effective automobile fender ever been developed? Are they required in any American city?—M. C., Chicago, Ill.

No. 106.—Progress Payments for Knob-and-Tube Work.—In conduit wiring it is customary among contractors to receive 60 per cent of the contract price on completing the roughing-in work, this comprising the installation of all the conduit, outlet boxes and so forth. What is the practice in this regard on large knob-and-tube jobs, in which the roughing work includes a much larger percentage of the material and labor to be supplied? Is 60 per cent or a larger part of the total cost demanded?—W. T. K., St. Paul, Minn.

No. 107.—Thermal Cutout for Flatirons.—I understand that there have been patented several thermal cutouts for use with electric flatirons to open the circuit automatically when a certain temperature is reached and thus prevent burning out of the heating element. Has any iron on the market been equipped with a device of this kind that is both reliable and foolproof, so that it can be entrusted to the ordinary household servant?—W. L., Beloit, Wis.

No. 108.—Lighting Store Windows from the Outside.—Has any extended use been made of the scheme of lighting store windows from the outside by means of single powerful lamps equipped with lateral reflectors to throw most of the light into the window and allowing some on the sidewalk? I saw an installation of this kind, which, while not artistic, seemed to be effective and certainly was economical. What, if any, objection could there be to such a scheme carried out so as not to be hideous?—J. P. C., Nashville, Tenn.

No. 109.—Electric Radiators.—Why are electric radiators not so generally used in this country as in Germany and England?—B. T., Baltimore, Md.

Answers.

No. 99.—Reflectors for Railroad-Platform Lamps.—I have frequently noticed that the reflectors used over the lamps on station platforms are generally in bad condition both from corrosion and lack of cleaning. What type of reflector is best capable of giving reasonable efficiency and long life under these adverse conditions? Would repainting the inside of the ordinary tin reflector twice a year with good white paint answer the purpose as well as an enameled or glazed reflector? Does white enamel withstand the action of sulphurous locomotive smoke?—B. N. P., Evansville, Ind.

We have in use many white-enameled reflectors on station-platform lights and on outside fixtures around the various shops. The standard reflector used is the Benjamin reflector socket No. 5437 which screws on to one-half-inch conduit and has no screws or brass fittings exposed to the corrosive gases always present around railroad premises. By "white-enameled" I mean the "fired" enamel and not that applied with brush. Of course, these reflectors have to be cleaned just as any other reflector, but I have found that the smoke does not materially harm the surface. The tops become somewhat rough from red-hot cinders dropping on them and sticking, but the enamel remains intact. I use Sapolio or some similar material to scour the reflectors.—R. W. E., Chillicothe, O.

No. 100.—Electric Welding.—What is the best method for electrically welding small articles with a butt joint less than one square inch in section? Is an arc used in spot welding of long seams?—F. D. A., South Omaha, Neb.

In the Thomson welding process, which is more widely used than any other method, alternating current is used for the reason that a large current at a low voltage is easily obtained by means of a transformer. A regulator, preferably an adjustable reactance, enables the primary current to be adjusted as desired. The secondary coil consists of a very few turns (sometimes only a single one) of heavy copper and has its terminals connected to the water-cooled clamps holding the pieces to be welded. Handles operate cams by which the pieces are clamped; one clamp is movable so the pieces can be forced together when hot enough. This is sometimes done by hand and sometimes automatically by air pressure, springs or weights. Only a very low voltage is needed in the secondary circuit, but a current density of 60,000 amperes per square inch is common in welding some metals like copper. A low frequency, such as 50 cycles or less, is preferred, especially for heavy work when the current density is high, because high frequency together with high current density causes high inductive effect with corresponding reduction in the power-factor of the system. The table herewith given by the Thomson

	Iron and Steel		Brass.		Copper.	
Area, Square Inches.	Watts in Welder Primary.	Time, Seconds.	Watts in Welder Primary.	Time, Seconds.	Watts in Welder Primary.	Time, Seconds.
0.125	.....	..	.....	..	6,000	8
0.25	.....	..	7,500	17	14,000	11
0.375	.....	..	.....	..	19,000	13
0.50	8,550	33	13,500	22	25,000	16
0.625	.....	..	.....	..	31,000	18
0.75	.....	..	19,000	29	36,500	21
0.875	.....	..	.....	..	43,000	22
1.00	16,700	45	25,000	33	49,000	23
1.25	.....	..	.....	..	.....	..
1.50	23,500	55	36,000	42	.....	..

Distance between clamps of iron and steel material = 2 × diameter.
Distance between clamps of brass material = 3 × diameter.
Distance between clamps of copper material = 4 × diameter.

Electric Welding Company, shows the power required to weld these joints in iron, steel, brass and copper. Tests have shown that 70 to 75 per cent of the power supplied is actually used in making the weld, thus comparatively little heat is wasted. As a rule long seams are not spot welded but are welded so as to make a continuous joint. However, for some classes of work a long seam can be spot-welded. Spot welding corresponds to riveting the seam at certain places. An electric arc can be used for spot welding if care is exercised. When the electric arc is used for spot welding a seam, one side of the circuit should be connected to the piece of material to be welded while the other side of the circuit is connected directly to the carbon electrode. Such an electrode may be 1.25 inches in diameter and is usually clamped between two copper plates, each at least five inches square and 0.5 inch thick. A special lug is used to make the connection, as a sweated joint is out of the question on account of the intense heat. The copper plates will last only about 15 hours, as at the end of that time the plates are so badly buckled as to be useless. If more information is desired the book entitled "Methods of Welding," by R. N. Hart, which can be bought at any technical book store, is recommended.—H. E. W., Chicago.

No. 101.—Fire Alarm for Hotel.—Is a closed-circuit automatic fire-alarm system more reliable for a hotel of 150 rooms than an open-circuit system?—N. J. R., Fort Worth, Texas.

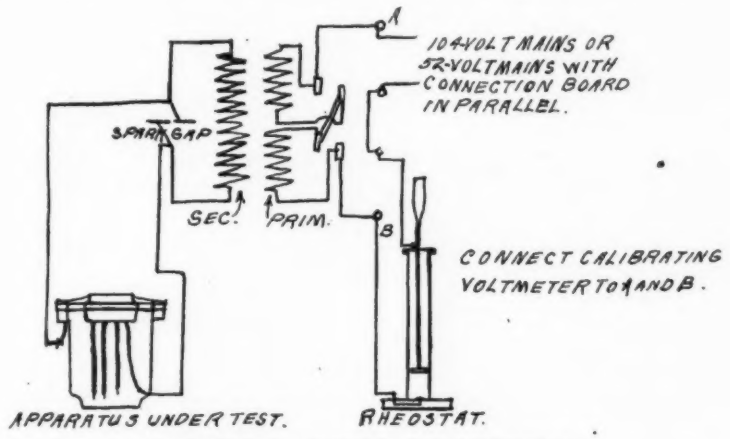
The open-circuit system is much more economical in operation because the current consumption is very small. If a defect develops in the main or branch wires leading to an absolute break, however, the system becomes absolutely worthless. Therefore, a close-circuit sys-

tem is very much to be preferred since a break in it immediately causes an alarm. An open-circuit system can be devised in which a test of the continuity of the wires can periodically be made and in which a break is detected by the sending of an alarm when the next test is made. The equipment for such a system is quite complicated, however, and I regard the closed system as the best because it is continually on guard for defects as well as fires.—G. H. T., Riverside, Ill.

No. 103.—Insulation Test of Transformers.—(1) Is the test for insulation resistance between the windings of a transformer by the voltmeter method considered reliable? (2) What should the insulation resistance be in ohms between the windings of the various sizes of transformers from 5 up to 250 kilowatts? (3) What method is used in testing the insulation at the factory?—J. G. M., Galveston, Tex.

The use of the voltmeter alone in the testing of transformers is not considered good practice, owing to the fact that certain insulations will show a very high insulation resistance by voltmeter but will fail in test under voltage little higher than operating pressure. The contrary is also true that insulations showing low value often stand up under test voltage and operating conditions. The best and common practice among manufacturers is to apply actual test pressures of approximately 10,000 volts between primary and core or secondary and 5,000 volts between secondary and core for not less than five minutes, also a no-load run at triple voltage for half an hour. The above applies to all sizes of transformers operating with 1,100 or 2,200-volt primaries and 110, 220 or 440-volt secondaries.—W. M. P., Seattle, Wash.

The voltmeter method is simplest but, since it cannot be used to measure resistances greater than a few megohms, the direct deflection method is more reliable. Sufficient data are not given to state what the insulation resistance should be. It would depend upon the working voltage of the transformer, the liability to high-potential surges, also upon the working temperature. Prof. William Esty in one of his books says that the insulation resistance of the complete apparatus should be such that the rated voltage of the apparatus will not send more than one millionth of the full-load current at the rated terminal electromotive force through the insulation. In the factory it is common to disregard the insulation resistance and design the transformer insulation to withstand at least two to five times the working voltage after two hours' constant operation at full load. The testing voltage for transformers up to 400-volt primary is 1,500 volts, 400 to 800-volts primary is 2,000 volts, 800 to 1,200-volt primary, 3,500 volts, 1,200 to 2,500-volt primary, 5,000 volts, and above 2,500 volts twice the rated primary voltage. The usual fuller board used in the insulation can be depended upon to withstand about 400 volts per mil in thin sheets, although much depends upon the moisture present in the material. The method of testing transformers in the factory is shown in the accompanying diagram, which needs no explanation.—H. E. W., Chicago.



Connections for Factory Test of Transformers.

(1) The voltmeter method of determining insulation resistance is considered a reliable practical method when carried out as follows: Connect one terminal of a high-voltage direct-current generator to one side of the primary of the transformer and the other terminal through a voltmeter to the secondary. Then the electromotive force of the generator minus the voltmeter reading is to the voltmeter reading as the insulation resistance between the primary and secondary is to the internal resistance of the voltmeter. From this relation the unknown resistance can be calculated. It is just as important that similar tests be made to determine the insulation resistance between the primary and case and the primary and core. A more accurate method of determining insulation resistance is by noting the rate of discharge through it of a condenser of known capacity. Insulation resistance tests should, if possible, be made at the voltage for which the transformer is designed.—(2) The ohmic resistance of the insulation of a transformer is of secondary importance only, as compared with the dielectric strength, or resistance to rupture by high voltage. The ohmic resistance of the insulation can be very greatly increased by baking, but the dielectric strength is liable to be weakened thereby; it is preferable, therefore, to specify a high dielectric strength rather than a high insulation resistance. The high-voltage test for dielectric strength should always be applied. The insulation resistance of any electrical apparatus should be such that the rated terminal voltage of the apparatus will not send more than one millionth of the rated load current through the insulation. If the value of the resistance exceeds one megohm it is considered sufficient. Information is desired concerning a line of transformers ranging in size from 5 to 250 kilowatts. Since the voltage is not given, it is reasonable to assume that they would be wound for 1,100-2,200-volt primaries and 110-220-volt secondaries. They come, therefore, under the ruling that all transformers having primary pressures of from 550 to 5,000 volts, the secondaries of which are directly connected to supply circuits, should have a testing voltage of 10,000 volts, to be applied between the primary and secondary windings, and also between the primary winding and the core. One manufacturer of transformers says, "All transformers are tested before shipment to withstand for one minute 10,000 volts from high-tension windings to core, tank and low-tension winding, and 4,000 volts for one minute from low-tension windings to core and tank. They are also tested to withstand twice the rated voltage applied across the terminals for one minute. These tests are made before the oil, which greatly increases the insulation, has been put into the tanks." Most manufacturers make similar tests. (3) The factory tests made on transformers are as follows: (a) insulation test; (b) measurement of core loss and exciting current; (c) measurement of resistance; (d) measurement of impedance; (e) heat test; (f) ratio and polarity test. The regulation and efficiency are calculated from the results of (b), (c) and (d). A special high-potential testing set is usually employed for all insulation tests.—F. C. L., Urbana, Ill.

Coal-mining-machinery improvements, largely of an electrical character, resulted in an increased output in the United States last year of coal mined with machines of four million tons over 1910, whereas there was a total decreased output of about 11,333,000 tons.

TELEPHONE PIONEERS MEET.

Second Annual Convention Held in New York and Largely Attended—Officers Re-elected—Chicago Next Year.

The Telephone Pioneers of America held their second annual convention in New York at the Hotel Astor, Thursday and Friday of last week. There were about 600 in attendance, from all sections of the United States. The first session began at 11 a. m. Thursday, and was called to order by Vice-President Frank H. Bethell. Several amendments to the by-laws were proposed, but went over to the next meeting.

On the suggestion of Thomas D. Lockwood, the chairman of the Executive Committee, the present officers were re-elected for the ensuing year, and are as follows:

President, Theodore N. Vail.

Vice-presidents, F. H. Bethell, B. E. Sunny, W. T. Gentry, E. B. Field.

Secretary and treasurer, Henry W. Pope.

Executive Committee: Thomas D. Lockwood, J. J. Carty, F. A. Houston, Thomas B. Doolittle, Charles R. Truex.

The afternoon session was presided over by Vice-President W. T. Gentry, and a number of interesting addresses were made, the first one by Thomas A. Watson, who was associated with Alexander Graham Bell in his early experiments and who heard the first spoken word over the telephone.

John J. Carty spoke of the future of the Association of Telephone Pioneers, suggesting that it partake more and more of an historical nature and include a museum of the many historical emblems of the telephone.

U. N. Bethell reviewed at length the history of the transmission of intelligence, dwelling particularly upon the development of the last third of a century and describing the growing benefits from the alliance of the telegraph and telephone service.

Other speakers were Emile Berliner, who described the early days of telephone work; and Samuel G. McKeen, who spoke interestingly and prophetically of the development of the telephone, interspersed with mention of humorous incidents.

The concluding address was by J. E. Kingsbury, of London, a pioneer telephone man of Great Britain, following an introductory address by Mr. Lockwood.

The afternoon program concluded with the reading of a humorous poem written by a lineman, which was applauded.

On Thursday evening the Telephone Society of New York presented a play in the large ballroom of the Hotel Astor before an audience of about 2,000. It was entitled "Examinations, A Cataclysm in One Spasm," and was written by Angus S. Hibbard. It was quite musical, very interesting, and unusually well presented, and author and cast were enthusiastically encored and complimented, Mr. Hibbard conducting the orchestra at the close. Several witty allusions to names and careers of prominent pioneers created much amusement. The entire cast and band were from the New York Telephone and Western Electric Companies. Fresident Theodore N. Vail, of the American Telephone and Telegraph Company, was present on this occasion, and upon his appearance was

Badge of Telephone Pioneers.

greeted with quite an ovation of applause.

On Friday the Pioneers and their wives motored to Briarcliff Lodge for luncheon and spent the afternoon in outdoor sports and games. On Friday night a banquet was held at the Astor, some 800 Telephone Pioneers and their ladies participating. The plate of each guest was located by an addressed telegram from President Vail, extending greetings, and a souvenir of a handsome pocket lead pencil made from wire, a gift of the Western Electric Company.

The second annual gathering of the Telephone Pioneers was unusually well attended, and the Association will rapidly increase as, under the present constitution and by-laws, new members become eligible.

The third convention is to be held in Chicago, and an invitation for 1915 has already been received from San Francisco to have the Pioneers visit that city on the occasion of the Pan-American Exposition.

Space will not permit us to name the many hundreds of Pioneers present at the second convention. The following are a few among the numerous well known faces that were seen: W. R. Abbott, Daniel M. Adee, E. B. Baker, Jr., Charles R. Bangs, D. H. Bates, E. Berliner, Victor M. Berthold, F. H. Bethell, U. N. Bethell, Fred J. Boynton, E. C. Bradley, A. R. Brewer, Belvidere Brooks, Charles H. Brownell, A. C. Cameron, W. L. Candee, John J. Carty, William F. Chester, F. W. Conn, Thomas E. Cornish, J. N. Culbertson, Robert W. Devonshire, Amzi S. Dodd, Thomas B. Doolittle, C. G. DuBois, Melville Egleston, Andrew H. Embler, C. J. French, W. T. Gentry, George A. Hall, Jr., John J. Ghegan, B. Gherardi, W. S. Gifford, Charles J. Glidden, Samuel M. Greer, F. W. Harrington, Angus S. Hibbard, E. T. Holmes, F. A. Houston, H. G. Huidekoper, Edward J. Hall, Leland Hume, F. B. Jewett, N. C. Kingsbury, L. H. Kinnard, Frank E. Leonard, Nathaniel W. Lillie, Thomas D. Lockwood, Frank J. McCann, Harry G. McCully, Charles W. McDaniel, S. G. McMeen, E. B. Madden, George T. Manson, G. C. Maynard, James Merrihew, Elmer P. Morris, Walter W. Nicholson, John O'Rourke, Moses Greeley Parker, F. A. Pickernell, Henry W. Pope, Charles W. Price, James Robb, Albert L. Salt, C. E. Scribner, John A. Seely, Thomas Sherwin, C. F. Sise, Jr., Walter N. Sperry, H. F. Stevens, Gerard Swope, H. B. Thayer, H. F. Thurber, Charles R. Truex, F. B. Uhrig, J. B. Van Every, William B. Vansize, W. T. Westbrook, Sr., George L. Wiley, Charles H. Wilson, W. H. Wolverton, C. J. H. Woodbury, P. Yensen, E. B. Zerman.

A very handsome telephone badge, which is reproduced herewith, was given to each Pioneer.

Hydroelectric Plant on Cheat River.

The West Penn Traction & Water Power Company, Pittsburgh, Pa., has completed arrangements for the equipment of its new 40,000-kilowatt hydroelectric plant, which is the first of a series of developments to be made on the Cheat River, near the boundary line between Pennsylvania and West Virginia. The electrical apparatus includes four 10,000-kilowatt Allis-Chalmers vertical waterwheel-type alternators, two 300-kilowatt motor-generator exciter sets and accessories.

The territory to be served by this system completely encircles the Pittsburgh industrial district. It involves 259 miles of 110,000-volt lines. Current will be furnished for the electrical operation of many of the steel mills, coal mines, etc.

Oil-Burning Plant of Dunlap Electric Company.

The accompanying illustrations from the generating station of the Dunlap Electric Company, Plaquemine, La., are typical of the modern plants for electric power and lighting now being erected in the South to serve industrial communities of 5,000 to 10,000 inhabitants.

The power house, as shown in Fig. 1, is a fire-proof structure of pressed brick, steel and concrete, 54 by 70 feet, equipped with an electric traveling crane spanning the entire engine room, and, with its abundance of light, ventilation, baths and sanitary appliances, is modern in every respect. The engine room and boiler room are separated by a fire-proof partition with fire-proof doors.

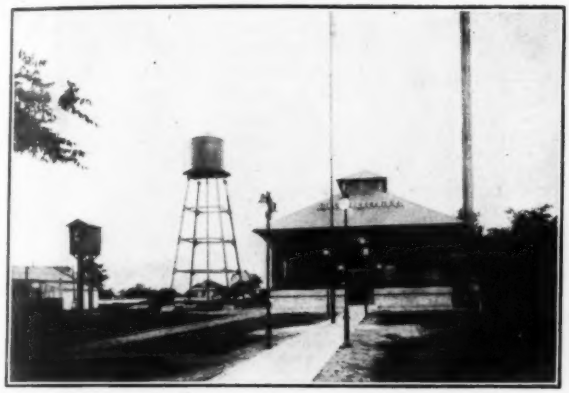


Fig. 1.—Power House of Dunlap Electric Company.

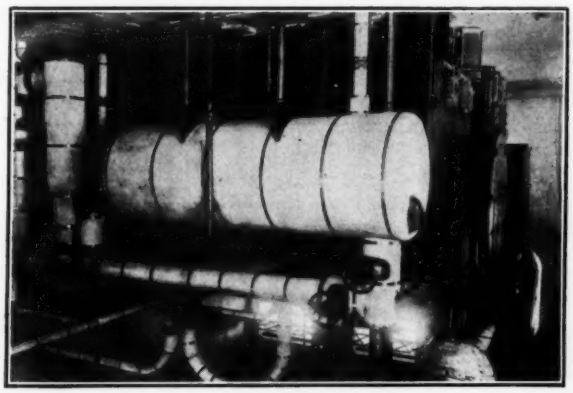


Fig. 2.—Boiler Room.

The boiler plant, Fig. 2, consists of two horizontal return tubular boilers, 72 inches by 18 feet, set in steel castings; two 6.5-by-4.125-by-8-inch Blake boiler-feed pumps; one open and one closed heater. In the piping connections each unit is by-passed to provide for its removal without a shutdown. The water supply for the entire plant is furnished by a 6-by-5.75-by-6-inch Deane duplex pump from a six-inch well 180 feet deep, to a 10,000-gallon tank at an elevation of 50 feet, as shown in Fig. 1. The boiler-feed water is automatically controlled in each boiler by Berry boiler-feed regulators.

Oil is used as fuel in each furnace by means of Higgins burners, the oil being supplied to these under a pressure of 40 pounds per square inch by two 3-by-2-by-3-inch Worthington duplex pumps. Results for the year 1911, as stated by F. E. Hubbard, secretary-treasurer of the company, show an average consumption of 10.46 barrels (of 42 gallons each) of fuel oil per day of 24 hours; being a fraction over 0.5 gallon per kilowatt-hour of energy generated.

The products of combustion pass to a Bethlehem-steel stack, 54 inches in diameter by 125 feet high. The entire boiler plant and its auxiliaries, including stack, piping, tank and tower was furnished and installed by the John H. Murphy Iron Works, of New Orleans, La.

The short lines of piping used in the boiler and engine rooms, direct connections and ample lagging indicative of good practice, are shown in Figs. 2 and 3.

The electrical equipment, installed by Henry Widmer, New Orleans, consists of two Bullock alternating-current generators, of 100 and 65 kilowatts capacity respectively, three-phase, 60 cycles, 2,300 volts, direct-connected to Skinner automatic engines of 150 and 100 horsepower respectively, operated at 125 pounds pressure. The speed is 277 revolutions per minute. Excitation is furnished by one 7.5-kilowatt engine-driven dynamo, direct-connected to a 5-by-5-inch American Blower Company vertical engine at a speed of 600 revolutions per minute, which is used for starting, and one 15-kilowatt induction motor-generator set when running.

From the generator terminals the current is led to a switchboard which is supported by a reinforced-concrete platform, as shown in Fig. 4. This consists of two generator panels, a double exciter panel and an alternating-current-feeder panel for the incandescent-lighting circuit; all with the usual bus and connection bars, rheostats, indicating and recording instruments, etc.

As the company has the city contract for street illumination, there are also installed at the right of the switchboard three panels with plug switches, regulators, etc., for single circuits of 6.6-ampere series arc systems of 25 lamps capacity each, the constant-po-

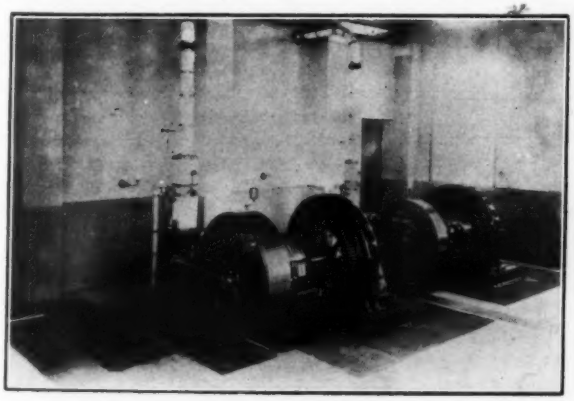


Fig. 3.—Dynamo Room.

Fig. 4.—Switchboard.

tential transformers for these being placed underneath the switchboard platform. A very noticeable feature of the installation is the concealing of all leads and cables, which are led through ducts in the switchboard platform, walls of power house, and underground to the terminal tower on the street, as shown on Fig. 1. In this tower, lightning arresters are connected to all outgoing and incoming lines.

The power station is in charge of Alex. Jeffrey, and E. E. Draughon is chief electrician. It is operated continuously, day and night, and the day load, while not large, is increasing.

Conversion of Three-Phase Into Single-Phase Current of Triple Frequency.

Under this title an article by F. Spinelli has been published in *L'Elettricista*, in which a static transformer is described, from which a single-phase current of triple frequency can be taken when three-phase current is applied to the primary winding. At the same time the apparatus seryes to transform the voltage.

To understand the development of this idea consider three single-phase transformers whose secondaries are connected in series, and let the primaries be excited respectively by the three currents of a three-phase circuit. If the cores of the transformers are not oversaturated and the primary voltage is sinusoidal, there will be no voltage at the secondary terminals, since the three induced electromotive forces neutralize each other at every instant.

If the iron is highly saturated, however, a voltage of triple frequency will appear at the secondary terminals. This may be understood by reference to Fig. 1, in which the three curves of flux in the cores of the three transformers are shown, and in addition the algebraic sum of the three. It will be seen that an electromotive force induced by the latter will have a frequency three times that of any one of the magnetic components.

Instead of using three separate transformers a better result is secured by using a single transformer, whose core has four arms, three of which serve as primaries and the fourth as secondary. The fourth arm serves as a common magnetic circuit for the flux set up in each of the three arms surrounded by the primary windings. Fig. 2 represents diagrammatically such a transformer, in which the secondary winding links the resultant magnetic flux of the three primaries. Such a special transformer offers no constructional difficulties. This type of transformer requires a magnetizing current somewhat larger than that used in ordinary static transformers in order that the iron be oversaturated. It, nevertheless, can be of high efficiency and has the three advantages of transforming voltage and frequency at the same time that a single-phase current is obtained from the three-phase circuit.

One application of this special transformer is offered by single-phase traction systems where the three-phase current has to be converted to single-phase. The necessary tripling of the frequency may here appear disadvantageous, but on the contrary it offers one distinct advantage, since it becomes

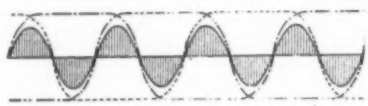


Fig. 1.

possible to transmit the electrical energy to a distance at low frequency. The fall of potential due to reactance of the line conductor is thus appreciably reduced, especially if the conductors are long and are widely spaced on account of high voltage. Thus from a ten-cycle, three-phase circuit one may obtain statistically a single-phase current of 30 cycles, which is admirably adapted to single-phase traction. Another field of industrial application is that of the distribution of energy for lighting. Here it will not only permit transmission at a low frequency, but permits the driving of motors upon the same primary circuit at the low frequency, while for

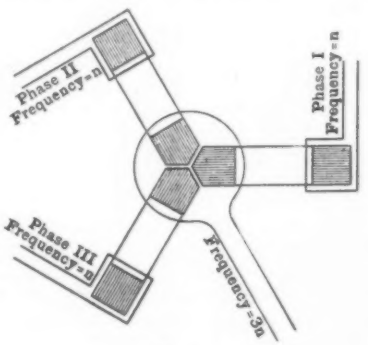


Fig. 2.

lighting the triple frequency of 45 cycles or higher is made available.

Another advantage is obtained with this type of transformer on fluctuating circuits, where a constant voltage may be obtained at the terminals of the secondary even though the primary three-phase voltage is subject to fluctuation. This is obtained through the oversaturation of the magnetic core. If an impedance in the form of a completely closed magnetic circuit of iron far from saturation is placed in series with the primary coil, the fluctuations of primary electromotive force are almost entirely absorbed by the inductance without sensible variations at the terminals of the frequency transformer. Thus the secondary will be almost independent of primary fluctuations; only the magnetizing current will vary.

The transformer and its potential regulator must be designed in such a manner that at the minimum admissible value of the primary voltage dependent upon the maximum obtainable reduction, the iron core of the transformer shall still be oversaturated; but its flux will correspond to a point of the magnetization curve close to the point of inflection. For all higher values of the primary voltage, although the magnetizing current increases, the voltage in the secondary will remain almost unaltered. The magnetizing current of the system must be designed to correspond to the maximum value of the primary voltage.

In three-phase traction systems, where the fluctuations of the voltage are considerable on account of the railway load, this transformer is capable of yielding very valuable practical results. It solves perfectly the problem of lighting of stations, because besides transforming three-phase into single-phase and tripling the frequency it gives a constant secondary voltage to the lamps, independent of primary fluctuations.

Electrical Exports for September.

The Bureau of Foreign and Domestic Commerce, Washington, D. C., has issued its monthly summary of imports and exports of the United States for September. From this source are obtained the following data relative to the electrical exports for that month.

The total value of the electrical shipments for last September shows some falling off compared to the two preceding months, but a substantial increase over the total of a year ago. Further comparisons are impossible on account of the new classification adopted in the government reports. The following are the detailed figures:

Articles.	No.	Value.
Dynamos and generators	.....	$ 349,693
Motors	.....	183,347
Fans	1,992	28,758
Arc lamps	1,168	19,880
Carbon-filament lamps	105,532	16,787
Metal-filament lamps	120,291	31,196
Telegraph instruments (including wireless)	.....	24,430
Telephones	.....	122,916
All other	.....	1,075,393
Total, Sept., 1912	.....	$1,852,400
Total, Sept., 1911	.....	1,500,600

Electric Dock Cranes for Genoa, Italy.

Electrification of all the dock cranes and other apparatus in the port of Genoa, Italy, is being considered by the Consorzia Autonomo. Of the 100 dock cranes in service, 20 are already operated electrically. There are also in operation 20 electric traveling cranes. Electric operation has been found very satisfactory.

Chicago Section of Electric Vehicle Association of America Discusses Co-operative Methods.

At the regular monthly meeting of the Chicago Section of the Electric Vehicle Association of America, held at the Hotel Sherman, Chicago, at noon, November 19, Henry Farrington, editor of the *Power Wagon*, delivered a very interesting and forceful address on the topic "Let us all Compete Against the Horse." Mr. Farrington called attention to the unnecessary repression of good will and confidence that were the direct results of indiscriminate statements disparaging various types and makes of power vehicles by the salesmen representing the various companies. He called attention to the great growth of the gasoline-vehicle industry, and the power and prestige that were behind this development. He felt that in the swift competition that was engendered by the contrasting types of electric and gasoline vehicles that very often the salesmen resorted to statements which militated against the acceptance of a satisfactory estimate of any type of vehicle upon the part of the prospective purchaser. He counseled the salesmen to first of all approach the prospective customer with the idea of settling definitely in the customer's mind the advantage of any type of either electric or gasoline vehicle being economically superior to any type of vehicle being drawn by horses. After the prospect had been well convinced of the desirability of eliminating the use of horse-drawn vehicles the fight could then be made with regard to either the choice of an electric or gasoline machine.

Mr. Farrington also suggested that a possible way of reaching the ordinary user of a power wagon such as the corner groceryman or the man with a very limited service, might be through the agency of large central garages supplying battery service upon a per-diem basis. The purchaser could then purchase his vehicle without the batteries and this might be a step toward a more rapid introduction of the power-vehicle among this class of user.

Mr. Farrington also suggested closer co-operation with the local automobile trade association as a means toward securing better conditions throughout the city for the operation of power vehicles.

A brief discussion followed. Ernest Lunn of the Commonwealth Edison Company introduced W. H. Metcalf, chairman of the commercial vehicle division of the Automobile Trade Association of Philadelphia. Mr. Metcalf described the work of the commercial section of the Automobile Trade Association and explained how the formation of a round table and a heart-to-heart discussion of the problems involving prices, terms of sale, unfriendly competition and unfair statements eliminated a great deal of friction and rendered the automobile business in Philadelphia a clean and wholesome proposition. The discussion was further participated in by W. J. McDowell, of the General Vehicle Company, H. T. Murphy, of the Elite Garage, Chicago, and George Harvey Jones, of the Commonwealth Edison Company, who presided.

On December 17 the section will listen to an address by H. J. Murphy, of the Elite Garage, Chicago, and at the meeting on the third Tuesday in January of the new year an address will be made by H. F. Thomson, of the Massachusetts Institute of Technology.

Post-Office Lighting.

At the monthly meeting of the Chicago Section, Illuminating Engineering Society, held on the evening of November 13, a paper by William A. Richardson, entitled, "Post-Office Mail-Case Lighting," was, in the absence of the author, read by E. B. Gray.

This paper described the installation in the Chicago post office. The mail and distribution cases are lighted by a line of five-watt tungsten lamps, spaced on two-foot centers, and placed in rigid fixtures screwed to the case and adjusted to keep all light out of the line of vision. Ten lamps are connected in series on a 110-volt circuit. Holophane-D'Olier steel reflectors with interior aluminum finish are fitted to special sockets for locating burnt-out lamps. These sockets are provided with a push-button, which short-circuits the lamp. From four to six foot-candles are obtained on the working plane. The average life of the five-watt lamp has been found to be 2,200 hours, but many lamps have given service up to 8,000 hours.

All mail cases are joined by separable trailer connections, except the master case, which conveys the feeders from the floor. These cases can consequently be shifted, and as this is frequently done in the post office, these connections have been an important labor-saving factor. Where floor boxes are not convenient for connection, a floor-grooving machine is used to cut a 0.625-inch groove in the hardwood floor, in which a lead cable is laid to the nearest floor box. An oak strip is then glued and toenailed into place.

Newspaper cases are fitted with racks made of conduit and condulets. Four 15-watt tungsten lamps are used on a three-man case and are placed two feet apart. By means of a 15-degree-angle Holophane-D'Olier steel reflector, the light is shaded from the distributor's eyes and thrown on the mail bags.

General illumination is obtained by the use of 100-watt units fitted with 18-inch white porcelain-enamel reflectors suspended 15 feet from the floor.

In the office portion of the building prismatic glassware is fitted to all chandeliers, 25-watt lamps being used for general illumination and 15-watt lamps for desk work. The latter are fitted with bowl-type steel reflectors with aluminum interior, and exterior of mahogany finish. A quick-release clip-spring holder is used for these reflectors.

The post office has a working floor space of 800,000 square feet and is used by over 5,000 employees. Twenty-four-hour service is necessary, yet the annual consumption is only 1.13 kilowatt-hours per square foot of floor area. Current is purchased from the Commonwealth Edison Company.

An animated discussion followed.

The program for the remaining meetings of the season has been provisionally arranged as follows:

December—"Industrial Lighting," by Ward Harrison.

January—"Indirect Illumination As Applied to General Offices," by T. H. Aldrich.

February—"The Influence of Colored Surroundings Upon the Color of Useful Light," by M. Luckiesh; "Some Application of Illuminating Engineering to the Conservation of Eye-Sight," by F. A. Vaughn and N. M. Black. This meeting will probably be held in Milwaukee, Wis., in conjunction with the Milwaukee Electrical Show, and the program will probably also include a paper upon "Gas Illumination."

March—"Hospital Lighting," by M. J. Sturm.

April—"Light, Shade and Color in Architectural Effects," by Bassett Jones, Jr.

May—A paper on "Gas Illumination" not yet arranged.

June—"Some Phases of Illumination and Eye Strain," by Arthur J. Sweet.

Meeting of County Light Section.

At the November meeting of the County Light Section of the National Electric Light Association, held in the Rittenhouse, Pittsburgh, Pa., on November 7, a paper prepared by R. F. Gooding, was read by J. P. Vogel. It concerned the launching of the electrical industry in Pittsburgh, in which the early shortcomings of the work, as well as the more recent successes, were set forth. President Joseph McKinley presided.

Electric street and house lighting began with the coming of the Allegheny County Light Company in 1880, with a capital of $90,000. The first arc lamp was installed at Fifth Avenue and Wood Street.

Decision Upon Breach of Contract and Alleged Fraudulent Representation—Central Electric Company Wins Judgment.

A decision of interest to the trade was made recently by Judge Whitford, of the District Court, Denver, Colo., in the case of John A. Savage *vs.*. Central Electric Company, Chicago.

For many years, Savage had been the western representative of the company, but was discharged in the summer of 1910 for what the Central Electric Company deemed good and sufficient reason. Savage promptly brought suit in the Denver Court to recover the July salary and obtained judgment. The case recently decided was to recover the August salary.

The contract of employment provided that Savage would not be interested in any other business during the term of the contract. The Central Electric Company contended that during the term of the contract Savage had secretly conducted a competing business under the name of Northwestern Supply Company and hence was not entitled to the August salary. The original stock book of the Northwestern Supply Company was introduced in evidence from which it appeared that Savage owned 497 shares of capital stock out of a possible 500 shares. The original minutes of the company were also introduced in evidence to prove the ownership of the stock. The Central Electric Company proved that there were two sets of original minutes, one showing ownership by Savage and the other showing ownership by one H. J. Barker.

Barker testified that he rewrote the original minutes at Savage's suggestion so as to cover up Savage's connection with the company and that Savage while on the road for the Central Electric Company had diverted business from his employer, and turned it over to his own concern, The Northwestern Supply Company. Savage claimed that the only interest he had in the Northwestern Supply Company during the term of the contract was as a holder of the stock as collateral security for a loan made by him to Barker, although, while on the witness stand, he admitted having instructed Barker to destroy certain correspondence in order to conceal his identity with the Northwestern Supply Company.

Judge Whitford held that Savage had violated his contract and rendered a judgment in favor of the Central Electric Company.

After this decision, the Central Electric Company started three suits in the Denver courts against Savage, one of which was to recover the money collected by Savage under the July salary judgment, the Central Electric Company claiming that Savage used fraudulent means and perjured testimony to obtain the judgment. Another suit is to recover all salary paid Savage under his contract, the Central Electric Company claiming that Savage fraudulently represented that he was not engaged in any other business while its contention is that Savage was secretly engaged in operating the competing business during all the period covered by his contract. The third suit is to recover damages for Savage's alleged malicious interference with the Company's business, the Company claiming that Savage maliciously induced Burton R. Stare, of Seattle, to refuse payment of an account owed by him to the Central Electric Company and which he had agreed to pay. The Central Electric Company was compelled to sue Stare in Seattle to enforce payment, and was successful.

Under the Colorado laws Savage might be confined in the county jail for one year under each suit if the Central Electric Company recovers judgment, unless he pays whatever damages are assessed against him.

National Association of Railway Commissioners Meets in Washington.

The annual meeting of the National Association of Railway Commissioners was held in Washington, D. C., during the past week, the conference being opened on the morning of Tuesday, November 19. The meeting will undoubtedly produce some important results, not directly perhaps, but indirectly as a means of indicating legislation which may result from the movements expected to be inaugurated by the present conference.

The opinions expressed by the State Railway Commissioners to the twenty-fourth annual convention, indicate the expectation of bringing about judicial interpretations of existing laws which will assure control of all railway rates, state as well as national, by the Interstate Commerce Commission. The state commissioners believe it is to the interest of the country to create a uniform system of rates.

The report of the "Committee on Accounts and Statistics of Electric Railways" recommends that the national association take steps toward the preparation of a uniform system of accounts through a committee empowered to confer not only with the Interstate Commerce Commission and the committee on standard classification of the Electric Railway Accountants' Association, but also with other committees of the accountants' and the engineering sections of the American Electric Railway Association. The committee presenting this report consists of A. F. Weber, statistician of the New York State Railroad Commission, chairman, and the following commissioners: George W. Bishop, Massachusetts; James A. Willoughby, Illinois; John F. McClure, Indiana; James E. Sague of the Public Service Commission for the Second District, State of New York; Nathaniel Ewing. Pennsylvania, and George F. Giddings, clerk of Maine State Railroad Commission.

The committee on telephone and telegraph rates and service consists of H. J. Winnett, state railroad commissioner of Nebraska, chairman; E. S. DePass, Arizona; F. C. Robinson, South Dakota; W. H. Stutsman, North Dakota; A. P. Watson, Oklahoma; Thomas W. D. Worthen, New Hampshire, and William R. Wilcox, public service commissioner for the First District, State of New York.

The report of this committee is generally a philosophical treatise on the history and development of the telephone business, and a hypothetical question as to whether, granting that a monopoly of the telephone business will best conserve the interests of the subscriber, will the telephone company live up to its sacred duty in providing adequate service at an equitable rate, or will it shrink within itself and provide only those extensions and that adequacy of service which may be forced upon it? The report inclines to the belief that business policy and a recognition of the opportunity thus created would stimulate a desire upon the part of the monopoly to render adequate service. The restraint from unnecessary investment and the economy resulting from the elimination of dual plant capacity and service would eventually tend to the reduction of rates to the consumer and insure an adequate return upon the investment, at the same time assuring this return without any hazard in development.

The report is also of the opinion that a uniform system of accounting for telephone and telegraph companies would be advisable, and that until this matter is satisfactorily adjusted it will stand in the way of the ultimate solution of all controversies with regard to telephone rate and service regulation.

The committee announces that in so far as notice has come directly to it, or indirectly with regard to complaints lodged with commissions, there seems to be little controversy at the present time between the public and the telephone companies regarding either rates or service. No marked abuses nor suggestions of needed reforms have been brought to the attention of the committee as demanding consideration.

New Electrical and Mechanical Appliances

New Precision Photometric Apparatus.

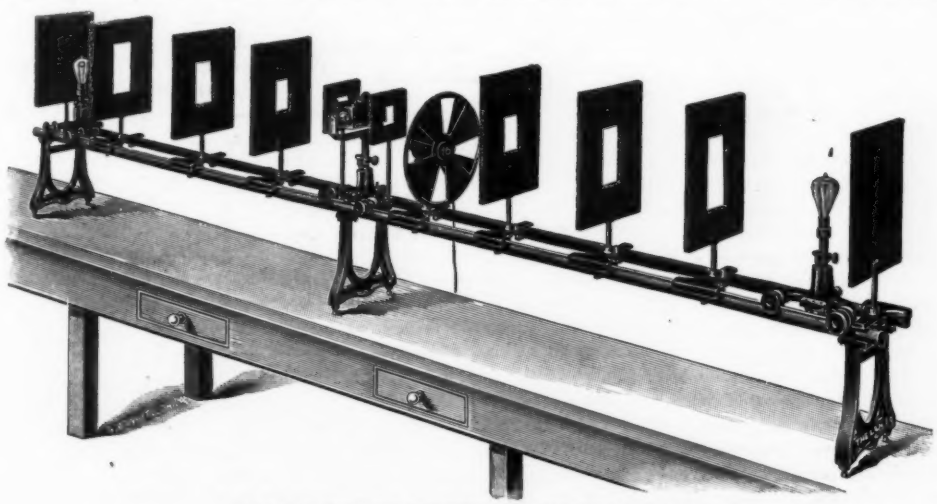
In order to bring its line of photometric apparatus up to date the Leeds & Northrup Company, Philadelphia, Pa., has been engaged for very nearly two years in redesigning such apparatus. It has now completed a Reichsanstalt equipment which is shown herewith. During the course of this work representatives of the company have visited many of the more important photometric laboratories, studied their equipments and conferred with their engineers from whom they received many valuable suggestions. Among these laboratories were: the laboratory of the National Electric Lamp Association at Cleveland, Ohio; the Holophane laboratory at Newark, Ohio; the General Electric Company's laboratory at Schenectady, N. Y.; the Electrical Testing Laboratories at New York City; and the laboratories of the United Gas Improvement Company at Philadelphia, Pa. They have also had frequent conferences with the photometric specialists of the Bureau of Standards at Washington, D. C., and have adopted many of their suggestions. All the apparatus has been thoroughly tried out in the Leeds & Northrup Company's own laboratory.

The tracks, which are the basis of the equipment, are of cold-rolled steel shafting, each one and five-sixteenths inches in diameter. The scale is cut upon a brass strip which is fastened on the top of one rail. The divisions are white upon a black background. The design of the supports is such that, although the rails are 11.5 inches above the table, they are perfectly rigid, both with respect to themselves and the table.

The carriages run easily and smoothly upon the rails. Fine vertical adjustment of the lamp or observing screen is made by means of a slow-motion screw. Rough adjustment is made by sliding the standard supporting the lamp or screen within the sleeve used for the fine adjustment. A small incandescent lamp for reading the scale is provided on the observing carriage.

A complete system of screens has been provided which enables the photometer to be used in a medium light room. The light-room method of photometry is used by the Bureau of Standards and others, and is very strongly recommended. The screens are covered with velvet. This has been found to be the best material for this purpose.

In order to measure accurately the candlepower of any lamp when its candlepower is quite different from that of the standard, the use of a rotating sector is recommended. It will be seen from the illustration that such an instrument is included in this equipment. The design of the instrument is based largely upon recommendations of the Bureau of Standards. It consists of four accurately perforated disks and a 110-volt direct-current or alternating-current motor supported adjustably upon a base, which may be clamped in any position on the track. One or two of the four disks are clamped upon the shaft of the motor, depending on the proportion of light to be intercepted. The Leeds & Northrup universal rotator, which is already in extensive use, has been redesigned to form a component part of this equipment.



Leeds & Northrup Precision Photometric Apparatus.

Protection Against X-Rays.

A great discovery that is expected to remove the danger to which manipulators of the X-ray have been subjected in its handling has been announced by the Academy of Sciences by L. G. Droit. In his experiments M. Droit was impressed with the remarkable capacity of silk while being dyed to absorb considerable quantities of metallic substances. With the aid of two silk manufacturers, M. Droit succeeded in getting a piece of silk heavily absorbed with lead and other substances which proved impenetrable against the rays. One piece of silk thus charged weighs 266 grams to the square meter. With six thicknesses of this silk M. Droit fashioned a short glove, which he has used successfully in handling X-rays. The glove possesses the double advantage of suppleness and protection against the X-rays. M. Droit says the repeated tests have proved the complete efficacy of the glove in warding off injury to handlers of X-rays, and he expects it to greatly facilitate examinations and experiments with them.

Metropolitan Alternating-Current Network Protector.

In the distribution networks of large electric light and power companies it is becoming the practice to use larger transformers than heretofore and to interconnect them both on the primary and secondary sides instead of using small isolated units. This has many advantages among which are: reduction in number of transformers required, improvement in efficiency from the use of larger units, and better voltage regulation. Advantage is taken of the diversity-factor in the customers' demands and, if proper protection is provided for the transformer system, the continuity of service on the entire network is greatly improved because on the failure of one transformer the others should automatically take up its load.

However, in actual service the parallel connection of transformers has until now not been regarded as desirable, because in case of burnout or short-circuit in one transformer only one side of it, as a rule, has been disconnected from the system, the other side remaining as a heavy short-circuit to further load down the network; the result has usually been overloading and blowing of the fuses of the next adjacent transformer, the trouble rapidly spreading to all units in the network and causing a complete shutdown thereof.

To remedy this defect the Metropolitan Engineering Company, 1238-1252 Atlantic Avenue, Brooklyn, N. Y., has placed on the market a recently patented alternating-current network protector that permits the attainment of all the advantages of multiple connection of large distributing transformers enumerated above. The accompanying illustrations show the external and internal appearance of this device and the principle of its connections.

The Metropolitan protector is a series or current transformer with three windings that is mounted near the step-down or distributing transformer. Its primary is connected in series with the primary of this transformer; a secondary winding is also connected in series with the secondary of the distributing transformer; the third winding has but few turns of heavy wire short-circuited by a V-shaped fuse, so that when this winding is energized a very heavy current will flow through the fuse. The primary and secondary windings of the protector have the same ratio as the primary and secondary of the step-down transformer with which they are respectively in series; therefore, under normal conditions the primary and secondary currents in the protective device oppose each other perfectly and no current is induced in the short-circuited tertiary winding.

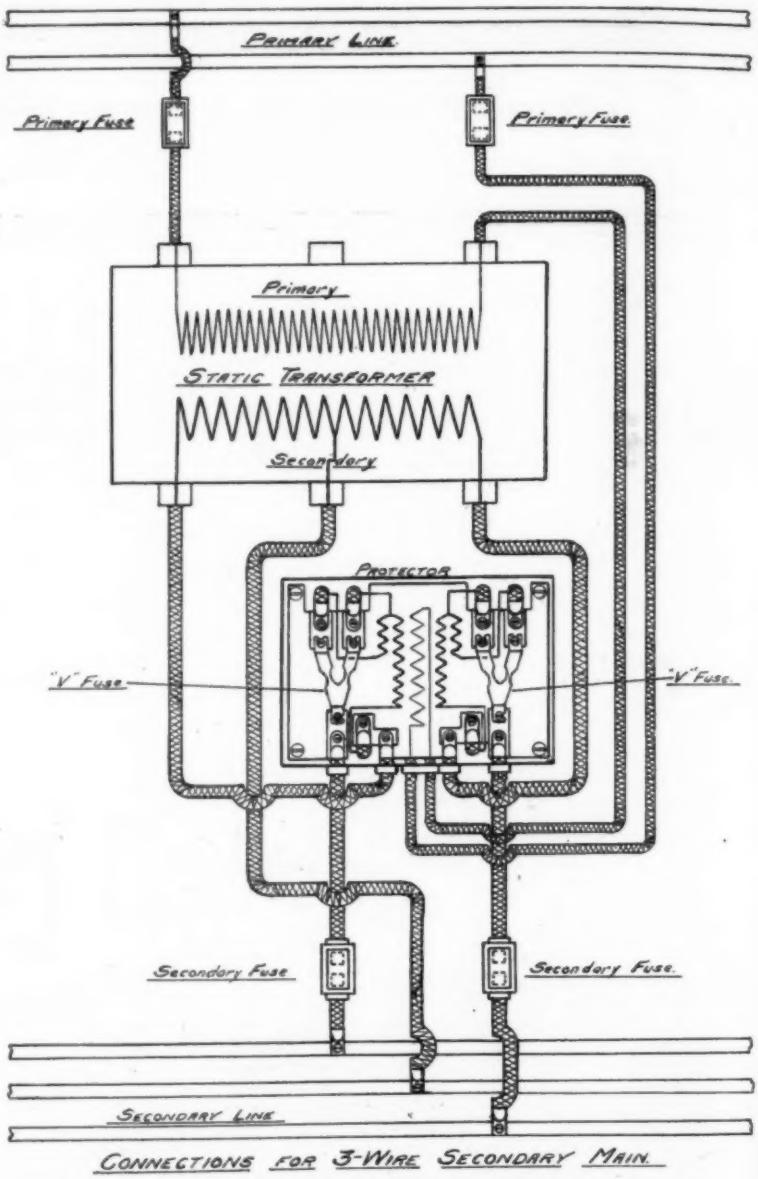
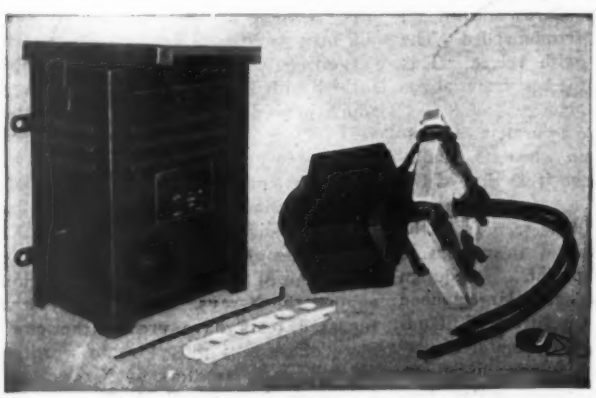


Diagram of Connections of Transformer and Protector.



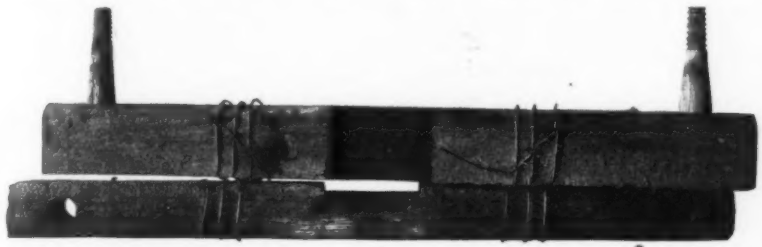
Metropolitan Network Protector with Element Removed from Case.

This balanced condition is maintained at all loads and is upset only by a reverse current flowing from the secondary network into the transformer, as would occur on a short-circuit in the latter. Such a reverse current immediately reverses the polarity of the secondary coils and induces a heavy current in the short-circuited winding, thus blowing the V fuses and consequently opening the secondary circuit which isolates the damaged transformer. A reverse current of one-fourth full load in the secondary is sufficient to blow the V fuses. The Metropolitan protector is made in sizes to suit all ratios and ratings of distributing transformers.

Unique Exhibit of Fir Crossarms that Were in Service 43 Years.

The American Crossarm Company has in its Chicago office in the McCormick Building a dozen crossarms taken from a line of the Western Union Telegraph Company, between Cobre, Nevada, and the Utah State line, which were put up on the poles in 1869. They are three-foot two-pin arms which have been replaced this year by ten-foot ten-season in its fight against the permanency of the telegraph line.

The arms were evidently painted when put up, as the surfaces on the bottom of the arm and in the gain still show traces of paint. This paint probably did no harm to the crossarm, but it was all worn off of the top and sides; and the natural wood, without protection of any kind has withstood the action of the weather since a time



Two of the Crossarms with Quaint "Lightning Arresters" and Pins in Worse Condition than Arms.

pin arms. They show the old-time construction of having the arms partially wound with No. 13 gauge wire as a lightning arrester, and were erected in the "triangular" manner, having one pin set in the top end of the pole, around which was a zinc collar to prevent checking or splitting; below this was a three-foot two-wire crossarm, and below that a six-foot four-wire arm. The arms also show the early stage of construction in having the "gain" cut in the arm instead of in the pole. The poles were of California redwood, sawed square, with a pointed top, and the arms were of Washington fir or, as it is sometimes called, yellow Douglas or Rainier fir.

The pins are badly used up, but the crossarms, after 43 years of service, show no signs of rot or decay, although they are checked to some extent. The outside of the arms is worn in places where sand storms have beaten upon them; the hot desert sun of summer has alternated with the disintegrating effect of the stormy winter when telegraph lines were the only means of speedy communication.

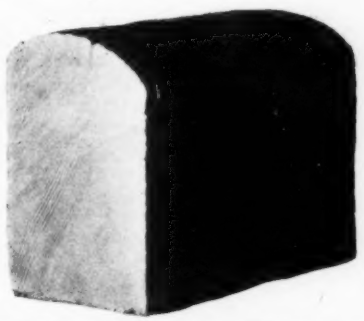
These Rainier fir crossarms, which have become noted for their strength and extreme durability, are made from the old yellow fir trees, giants of the forest, which grow on the Cascade Mountains in Washington. Some of the trees run from 14 to 16 feet in diameter and 400 feet in height, 200 to 250 feet without a branch. These trees give a very close-grained, strong timber which does not rot, and is the very best possible material for the manufacture of crossarms.

The trees, growing to such a height before branching, give a lumber practically "clear" or free from knots; the grain is from 12 to 30 annular rings per radial inch, so close that moisture does not seep in and start rot. This lumber is very straight-grained, and tests made by the United States Government show that its strength is considerably more than double that required to meet the utmost strain put on it when in use as a crossarm.

The Big Logs From Which the Crossarms Are Made.

All these qualities have brought the Washington fir into such favor for use as a crossarm material that now, in spite of the fact that freight rates make the original cost somewhat higher than that of arms made from other material, its strength and extreme durability make its ultimate cost so low, and its use so economic that a large proportion of all the crossarms being purchased today for new construction are made in Washington from Rainier fir.

On the line mentioned above, from which these 43-year old arms were taken, there had been placed in the early eighties, below the three-foot two-wire arms, a set of six-foot four-wire arms, also made from Washington fir. These arms being of a pattern still standard with the Western Union Telegraph Company, and being found in good condition after about 30 years of service on the pole (although not wanted on the main line, where only ten-foot ten-wire arms were now to be used), were sent to a branch line,



Section Through Crossarm, Showing Closeness of Grain and Solidity of the Wood.

and put on the poles for another stretch of service.

So far as we know, this is the best existing example of the long life of fir crossarms in actual service, although future years will probably develop still more striking instances.

Small Meters for Automobiles and Switchboards.

Meters of the type illustrated on the next page, which are only three inches in diameter, are used on automobiles, motor boats, yachts, and small switchboard panels, such as small battery-charging panels. They operate on the D'Arsonval principle, having a moving coil and a permanent magnet, which renders them free from residual errors. Their high torque and high damping characteristics make them especially applicable to automobile use as the pointer does not vibrate. They are not in any sense small toy meters but are strictly high grade in quality.

The complete movement is mounted as a unit and is readily removed for repairs. In order to remove the moving

element all that is necessary is to take off the rim and glass cover and take out two screws on the side of the movement, when the entire moving element and bearings can be lifted out as a unit and can be replaced in exact position. This makes it possible to repair the meter without disturbing the alinement of the magnetic circuit. Owing to the use of an aluminum pointer, a light counterweight is employed, resulting in a light-weight movement and small wear on the pivot jewels. The full length of the pointer shows on the dial, thus making the meters as easy to read as the hands of a clock. The construction is such that the meter will withstand the shocks to which it will be subjected without its losing its guaranteed accuracy.

The light metal frame on which the moving coil is wound moves through the air gap on the strong magnets and makes the reading inherently dead-beat. This feature enables readings to be taken quickly, and prevents violent fluctuations from injuring the pointer or the moving element.

The scale is made of etched metal, and subtends an arc of 90 degrees, giving large open divisions which are uniform throughout. The ammeter scales have the zero in the center of the scale so as to indicate current in either direction. The voltmeters do not show the zero point, to obtain wide divisions and greater accuracy around the 5-volt point, which is the normal cell voltage for automobiles. The cases for these Westinghouse meters are finished in either dull black, polished nickel, or polished brass. A black dial with dull white lettering and scale is furnished, thus eliminating the glare incident to the use on a dark background.

The round form of meter is used for automobiles or on small switchboard panels. The flush meter is adapted for mounting on dashboards one-quarter inch thick or less and will then project in front of the board by less than one-quarter inch. The illuminated-dial meter is used largely on automobiles and is so constructed that when mounted on the dashboard the dial is set at an angle that will give a full view.

Westinghouse Three-Inch Meter.

Outdoor Substation Equipment.

It has long been recognized that the outdoor substation, especially in the smaller capacities, offers considerable advantage over the indoor type both in initial cost and operation. Practically every transmission company has opportunities to sell relatively small parcels of power to farmers, small communities, etc., located along its lines. This field has not, however, been properly developed owing to the lack of reliable weatherproof transformers and protective equipment, which could be installed at such a cost as to secure a fair return on the investment.

During the past two years the Pittsburgh Transformer Company has made a careful study of the conditions to be met, and as a result has developed the type of outdoor high-tension transformers shown in Fig. 1. It is generally agreed that the oil-cooled transformer is most suitable for this class of service; therefore, to avoid the necessity of drying out before installation, the type illustrated is shipped with the case filled with oil. The operation of installing is therefore reduced to merely placing the transformer in position and connecting up.

Fig. 1.—33,000-Volt Outdoor Transformer.

Both the high-tension and low-tension leads issue through weatherproof bushings located in the cover, thus securing a highly convenient method of connecting to both the line and load wires. The losses and radiation surfaces are so proportioned that low temperatures are maintained at all times, thus reducing to a minimum the danger of oil deposit settling on the elements or case and preventing proper cooling.

To secure proper control and protection under all conditions of overload or static, the Delta-Star type R weatherproof combination switches, fuses and horn-gap protectors have been adopted. This unit is shown in Fig. 2 and has the advantage of low cost combined with effective protection. Each unit consists of an underhung disconnecting switch, a vertically mounted chemical fuse, a choke coil and a pair of horn gaps, the entire equipment being mounted on a channel-iron base ready for placing on crossarms.

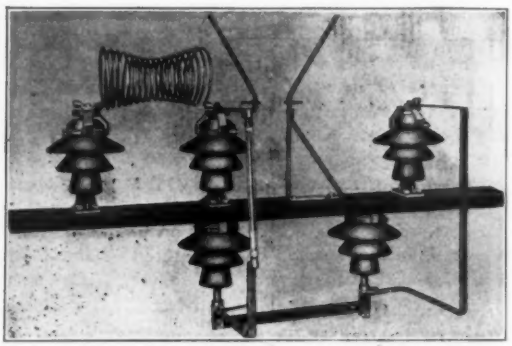


Fig. 2.—Outdoor Switch, Fuse and Lightning Arrester.

Under overload conditions the fuse ruptures, the arc being suppressed by the special liquid, thus effecting a quick opening with minimum disturbance. In case of lightning or static disturbances the incoming wave is retarded or damped by the initial turns secured in the arrangement of the right-hand vertical bus, the horizontal switch and the vertical fuse. After passing this path the surge encounters the large specially formed choke coil, which reflects it to the insulated horn gap, from which it breaks across to the horn that is permanently grounded.

The resultant arc immediately rises and ruptures on the diverging horns, the speed of movement being greatly accelerated by the blowing or magnetic turning effect of the choke-coil field. Ordinarily the arc is so rapidly extinguished that the special protective chemical fuse will not operate, but in cases of extremely heavy discharges the fuse will rupture, thus opening the circuit.

To replace a blown fuse it is simply necessary to open the disconnecting switch and, as the entire channel-iron mounting is permanently grounded, the lineman is not subjected to static shock or line potential under any conditions of leakage. By locating a small switch in the secondary side of the lighting or power transformer the equipment can be inspected under load conditions, as the disconnecting switches can then be opened without danger of arcing.

This method of control and protection meets the imposed conditions, as it is low in initial cost, requires no attendance, protects the equipment, and in case of serious trouble the service is effectively opened. Under such conditions it is better to clear the lines automatically and to localize the trouble rather than to endeavor to keep in operation with inevitable spreading of a relatively minor disturbance to the entire network.

Latest Approved Fittings

AUTOSTARTERS.—Wagner Electric Manufacturing Company, St. Louis, Mo.

Catalog Nos. 6-B-1, 7-B-1, 8-B-1, 9-B-1, 10-B-1.

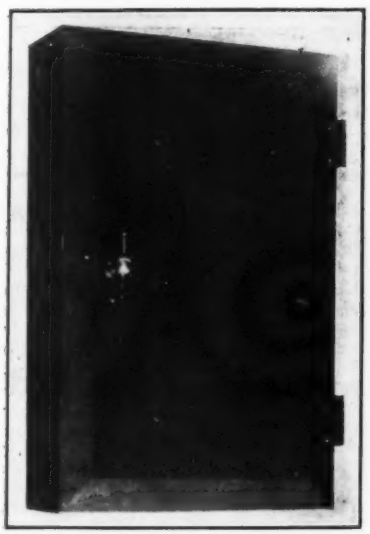
Approved October 11, 1912.

CABINETS.—Henry Newgard & Company, 947 Washington Boulevard, Chicago, Ill.

Approved October 2, 1912.

FIXTURE WIRE.—Standard, National Electrical Code, 1911 edition.

Fixture wire shown by tests and examinations conducted by the Underwriters' Laboratories to be in accordance with the requirements of the National Board of Fire Underwriters, and examined at the factories and passed by the Underwriters' Laboratories have standard labels attached to each



Cutout Cabinet.—Henry Newgard & Company.

coil. The following additional companies are equipped to supply these wires thus labeled:

Crescent Insulated Wire & Cable Company, Trenton, N. J.

Marking: Red and green threads crossing in braid.

Approved October 1, 1912.

Bishop Gutta-Percha Company, 420-430 East Twenty-fifth Street, New York.

Marking: One green cotton thread running parallel with wire between the rubber insulation and braid.

Approved October 1, 1912.

American Electrical Works, Providence, R. I.

Marking: Three red threads woven parallel in braid.

Approved October 1, 1912.

General Electric Company, Schenectady, N. Y.

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

Marking: Red and black threads woven parallel in braid.

Approved October 1, 1912.

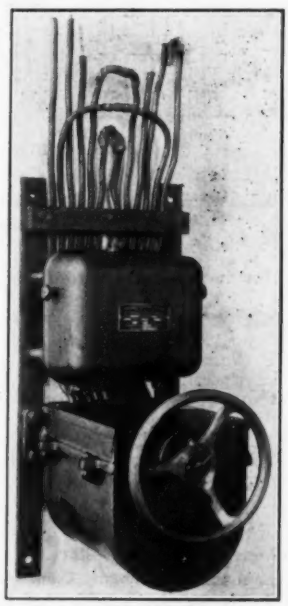
Hazard Manufacturing Company, Wilkes-Barre, Pa.

Miniature Socket.—Pass & Seymour.

Marking: Red and green threads parallel in braid.

Approved October 1, 1912.

Indiana Rubber & Insulated Wire Company, Jonesboro, Ind.



Autostarter.—Wagner Electric Manufacturing Company.

Marking: Two red threads parallel in braid.

Approved October 1, 1912.

Kerite Insulated Wire & Cable Company, 30 Church Street, New York.

Marking: Green and black threads parallel in braid.

Approved October 1, 1912.

Marion Insulated Wire & Rubber Company, Marion, Indiana.

Marking: Two green threads crossing in braid.

Approved October 1, 1912.

National India Rubber Company, Bristol, R. I.

Marking: Two blue threads parallel with wire between insulation and braid.

Approved October 1, 1912.

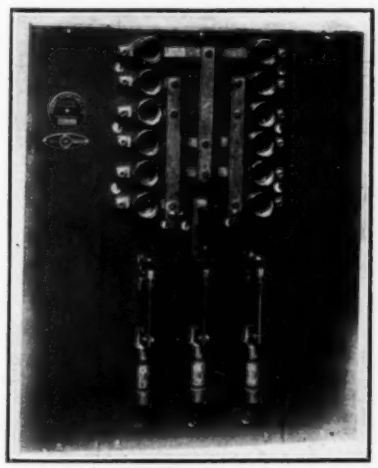
PANELBOARDS.—Butte Engineering & Electric Company, 683-687 Howard street, San Francisco, Cal.

Approved October 7, 1912.

PANELBOARDS.—Henry Newgard & Company, 947 Washington Boulevard, Chicago, Ill.

Approved October 2, 1912.

SOCKETS, CANDELABRA AND



Panelboard.—Henry Newgard & Company.

MINIATURE.—Pass & Seymour, Solvay, N. Y.

"F. & S." 75 watts, 125 volts.

Miniature porcelain socket with leads attached. Catalog No. 422.

Approved October 2, 1912.

SWITCH BOXES.—Bonnell Manufacturing Company, Cleveland, O.

Pressed-steel boxes in single units for use with flexible tubing. These boxes have one removable side and suitable fastenings by means of which a gang box of any desired number of units can be obtained.

Approved September 27, 1912.

SWITCHES, SURFACE SNAP.—Harvey Hubbell, Bridgeport, Conn.

Catalog No. 5027 with porcelain base.

Approved September 23, 1912.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

ROWAN, IOWA.—J. L. Sinclair contemplates installing an electric light plant.

SCRANTON, IOWA.—The town has voted to install an electric light plant. C.

PARKER, S. D.—The Council has granted a franchise to Charles H. Stanfield for an electric light plant. C.

OWATONNA, MINN.—The city has voted $10,000 for electric light posts and poles, wiring, conduits, etc. C.

ROBSTOWN, TEX.—It is reported that R. N. McNeil will erect a new electric light plant here at an early date.

CHATSWORTH, ILL.—The Central Illinois Utilities Company has been granted a 30-year franchise by the Village Board. Z.

AFTON, IOWA.—The town has voted to grant an electric-light franchise to the Creston Mutual Light Company. C.

SHELDAHL, IOWA.—The Boone Electric Company has accepted the franchise here for an electric light and power plant. C.

MOUNT VERNON, ORE.—The Pacific Northwest Traction Company has been granted a five-year contract to light the city.

CARLISLE, PA.—The Carlisle Light, Heat & Power Company has purchased a site and in the near future will extend its plant.

De RIDDER, LA.—The City Council has under consideration a bond issue for the purpose of installing a municipal lighting plant.

REDMOND, ORE.—George Jacobs, of Portland, Ore., has been granted a franchise for the construction of an electric light and power plant in this city.

NEENAH, WIS.—The mayor has appointed a committee to secure estimates for erecting a power house and equipment for a municipal lighting plant. Z.

PENDLETON, S. C.—The Pendleton Electric Light Company has been incorporated with a capital stock of $5,000 by E. N. Sitton, L. E. Sitton and C. S. Chreitzberg.

ALVIN, ILL.—The Village Board contemplates the use of electricity for lighting the village streets. Power may be secured from Hoopeston, Ill., or Potomac, Ind. Z.

ROCK ISLAND, ILL.—The city commission is experimenting with 100-watt lamps, which may be substituted for the 2000-candlepower arcs in the resident districts. Z.

CROWN POINT, IND.—The capital stock of the Calumet Electric Company has been increased from $10,000 to $200,000 for the purpose of making extensive improvements and extensions to the plant. S.

RICHMOND, CAL.—Business men and property owners have petitioned the City Council to establish an electrolier lighting system on some of the principal streets.

CLAY, KY.—The Clay Light & Ice Company of which C. R. Clark is general manager, is in the market for overhead line material, transformers, street lamps and poles. G.

PORTLAND, ORE.—The Northwestern Electrical Company has been granted a franchise in this city, and will commence construction immediately on its plant.

RICHMOND, VA.—Electrical equipment, including boilers, engines and pumps, is to be purchased by the Monroe Terrace Corporation, 412 Mutual Building, this city. G.

BLOOMSBURG, PA.—The Columbia & Montour Electric Company has been incorporated with a capital stock of $5,000. E. R. Sponser, of this city, is interested in the company.

MILTON CITY, ORE.—An election has been called for Dec. 10 to vote on the proposition of bonding the city for $18,000, to be used for the improvement of the city lighting system.

WOLVERTON, MINN.—E. E. Norton, of Breckenridge, S. D., is the promoter of a company which is being formed for the purpose of installing an electric lighting plant in this place.

SAN LUIS OBISPO, CAL.—The preliminary survey is being made for the high-power line which is being brought here from Coalinga by the San Joaquin Light & Power Company.

WILLIAMS, ARIZ.—The Williams Electric Light & Power Company, has applied for permission to issue bonds in the sum of $250,000, proceeds to be used for improvements to its present plant.

CUSHING, OKLA.—A charter has been issued to the Cushing Electric & Power Company, with $15,000 capital. The incorporators are F. M. Overlees, H. Askin, and J. W. Pollard, all of Bartlesville. P.

ELKHART, IND.—The Elkhart Retail Merchants Association has revived the ornamental-lighting project and has appointed W. A. Stanton to make a report in December upon systems in other cities. Z.

LIVERPOOL, O.—The City Council has authorized the Board of Control to secure the services of an expert to prepare an estimate of the probable cost of erecting a municipal lighting plant.

COUNCIL GROVE, KANS.—The Council Grove Ice, Light & Power Company has been incorporated with a capital stock of $35,000. The incorporators are P. M. Harlan, G. W. Harlan and T. W. Warner.

CHATTANOOGA, TENN.—Plans are in the hands of A. W. Burke, president of the Chattanooga Retail Merchants' Association, for installing an up-to-date luminous arc-lighting system along Market Street. G.

OKLAHOMA CITY, OKLA.—The Guardian Lighting & Industrial Company, of Crowder, has been granted an Oklahoma charter with $15,000 capital. The incorporators are A. F. Barrow, H. E. Rowton and E. G. Narrow, all of Crowder.

MARCELLUS, N. Y.—Marcellus Lighting Company, Incorporated, has filed articles of incorporation with a capital stock of $10,000. The incorporators are Frank W. Knapp, Marion E. Knapp and Sidney Slocombe, all of Marcellus.

LOUISVILLE, KY.—Merritt Drane is working upon plans for a hydro-electric power plant which is to be erected upon the Sublimity Springs property in Somerset, Ky., recently purchased by a syndicate of which he is a member. G.

ASBURY PARK, N. J.—The City Council has announced its intention of installing an underground conduit system for electric-lighting and telephone lines on Kingsley Street and Oak Bluff Avenue. Ornamental street lamps will also be installed. A.

SAN FRANCISCO, CAL.—The Mt. Whitney Power & Electric Company has applied for permission to issue bonds in the sum of $250,000, the proceeds to be used for the construction of generating plants and a reservoir on the Keweah River.

SPRINGFIELD, ILL.—The Twentieth Century Light & Power Company has been incorporated with a capital stock of $4,900 to manufacture and install electric light and power plants. The incorporators are A. R. Simpson, H. C. Kinkead and A. Mottar. Z.

BALTIMORE, MD.—At the recent election a bond issue of $2,000,000 was authorized for the extension of underground conduits. Plans and specifications are being prepared by R. C. Thomas, city engineer, involving the expenditure of about $500,000.

PLAINVIEW, TEX.—The Malone Light & Ice Company, of this place, has given a deed of trust to the Commonwealth Trust Company, of St. Louis, to secure $60,000 in bonds. This money is to be used for enlarging and better equipping the Plainview plant.

HENDERSON KY.—L. P. Hite, superintendent of the municipal electric light station and chief engineer of the work which he has in hand, may be addressed with reference to a 750-kilowatt turbine which he will add to the present equipment of the plant.

HAGERSTOWN, MD.—Wiring for electric light and power in the locomotive roundhouse is contemplated by the Western Maryland Railway Company.

Plans and specifications are being drawn up by the G. E. Painter Company, electrical engineers, of Baltimore.

SHERIDAN, IND.—A block of preferred stock amounting to $25,000 has been issued by the Sheridan Light, Heat & Water Company. The purpose is to obtain money with which to enlarge the plant and add new machinery to take care of the rapidly increasing business. S.

FORT WORTH, TEX.—It is reported here that Commissioner Duringer is interested in a plan to install a power plant in the basement of the court house. Mr. Duringer claims that the cost of installing this plant would not be much more than the present yearly cost of this service.

WELLAND, ONT.—This town has decided to proceed at once to install an entirely new plant for a hydroelectric lighting system. Some time ago $45,000 was voted to install a hydroelectric lighting system for the streets and residences, with the intention of either installing a new system or purchasing and reorganizing the Welland Electric Company's lighting plant.

NEW YORK, N. Y.—The Idaho Consolidated Power & Utilities Company, Limited, of this place has filed articles of incorporation in Dover, Del., the objects being to do a general public service utility business, such as the construction of railways, telephone and telegraph lines and water power plants. The incorporators include Raphael Brill, Simon Gross and Byron H. Hooper, of New York City. The capital stock of the company is placed at $500,000.

HARRISBURG, PA.—Each with a capital stock of $5,000 the Conestoga Township Electric Company, Martic Township Electric Company, Pequea Township Electric Company, Providence Township Electric Company, Strasburg Township Electric Company and the Elizabethtown and Marietta Electric Companies have been incorporated to operate in the districts for which they are named. The incorporators of these companies are W. W. Griest, J. S. Graybill, Jr., and C. Edgar Titzel, of Lancaster.

HARRISBURG, PA.—The Etna Electric Light Company, of Etna; the Millvale Electric Light Company, of Millvale; the Jefferson Electric Light Company, of Punxsutawney, have each filed articles of incorporation with a capital stock of $5,000. G. B. Fehr, J. G. Marks, A. K. Little, James Milholland and L. C. Shreve are the incorporators of the Etna and Millvale Electric Light Companies, and W. R. Nichol, W. M. Hill, F. J. Jones, W. C. Williams and D. G. Williams are the incorporators of the Jefferson Electric Light Company.

LOS ANGELES, CAL.—Approval has been given by the Board of Public Works to the contract whereby the Aqueduct Power Bureau is to construct a power distributing line to the plant of the Saline Valley Salt Company, in the Saline Valley, easterly from the Owens Valley. The company is to advance $5,000 for the work and the line is to be its property after construction, but it is to be used exclusively for the transmission of Aqueduct power for its own use and the supply of such other concerns along the route as may wish this benefit.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

VERNON, CAL.—Bids will be received until December 3 for a telephone and telegraph franchise in this city.

KELIHER, MINN.—The Keliher Telephone Company has been incorporated with a capital stock of $15,000.

EL PASO, TEX.—The American District Telephone Company has been granted the right to install night watch and burglar alarms in this city.

DOUGLASS, ARIZ.—The Mountain States Telephone Company has been requested by property owners to extend its lines through the Sulphur Springs Valley.

MARTINEZ, CAL. — The Pacific State Telephone & Telegraph Company is arranging to build a line from Suisun to Grizzly Island, a distance of about 15 miles.

SAN DIEGO, CAL.—The Pacific Telephone & Telegraph Company plans to expend about $10,000 the first of the year on a new switchboard for the local exchange.

SPRING GROVE, VA.—The James River Telephone Company has been incorporated with O. J. Schuster, president, and A. H. Oschner, Chicago, Ill., secretary and treasurer.

KONAWA, OKLA.—East Fairview Telephone Company has been incorporated with a capital stock of $500. The incorporators are G. W. Hager, R. W. Mann, Ed. Greer, all of Konawa.

LEEDY, OKLA.—Leedy Mutual Telephone Company has been incorporated with a capital stock of $3,000. The incorporators are W. S. Fred, C. H. Lathrop, and R. E. Ishmael, all of Leedy.

ROCKLAND, MASS.—The selectmen of this place have granted the Southeastern Massachusetts Telephone Company permission to set poles on Church Street, Linden Park and Linden Street.

GREEN SPRING, VA.—Watauga & Green Spring Telephone Company has been incorporated with a capital stock of $5,000. W. T. McConnell is president of the company and Guy McConnell, secretary.

MANGUM, OKLA.—Consolidated Independent Telephone Company has been incorporated with a capital of $5,000. The incorporators are D. H. Wright. T. P. Clay and J. H. Hartman, all of Mangum. P.

POMONA, CAL.—The Pomona Valley Telephone & Telegraph Company has applied for permission to issue bonds in the sum of $200,000, proceeds to be used for the extension and improvement of its system.

INDIANA, PA.—The Bell Telephone Company has announced its intention of making extensive improvements to its system in this county, among which is the rebuilding of the line connecting Blairsville and Du Bois, a distance of nearly 18 miles.

WILSON CREEK, WASH.—Some farmers have organized a mutual telephone exchange and three miles of line in the north end of Grant County will be built, connecting the farmers' line into Ephrata, with the Quincy Independent line and making a complete system. J. C. Oaks is president; Donald Urquhart, vice-president; and W. R. McDowell, treasurer of the company. Z.

ELECTRIC RAILWAYS.

(Special Correspondence.)

WASHINGTON, D. C.—A 20-year franchise for the use of Royal Street has been granted to the Washington-Virginia Railway Company.

MUSCATINE, IOWA. — Surveys are started for the construction of the interurban line from Iowa City to Muscatine. Construction is expected to start in the spring. C.

FORT WORTH, TEX.— It has been announced that the Stone & Webster Corporation will, after the first of the coming year, double-track the Dallas-Fort Worth interurban line.

HUNTINGTON, IND.—It is proposed to extend the electric line which is to be built from Hartford City through Warren, Huntington and north to South Whitley, to Warsaw.

LANCASTER, WIS.—The towns of Little Grant, Mt. Hope and Patch Grove have voted bonds to aid the construction of the proposed Chicago Short Line Electric Railway. The town of Ellenboro will vote on the matter December 3. C.

ELIZABETH, N. J.—The Public Service Railway Company has engaged Skillman, Delehanty & Ferris, engineers, Jersey City, for preliminary engineering work in connection with the proposed extension of its Trenton Short Line to Elizabeth. A.

MUSKEGON, MICH. — Business men of Muskegon, Manistee, Ludington and intermediate points are planning to raise $280,000, the bonus fund asked by the promoters of the so-called shore line interurban to connect Muskegon, Manistee and Ludington.

TAMPA, FLA.—The St. Petersburg & Gulf Railway is pushing to completion the extension of the Central Avenue line, immediately after which a loop will be built between Central Avenue and Tangerine Avenue. The next step will be an extension along Boca Bay in the other direction toward Clearwater.

CAMBRIDGE, O.—It is reported that W. Hunter Atha, of Zanesville, has secured the absolute right of way for the electric line from Zanesville to a point near the Shroyer farm, and it is stated that there is plenty of money back of the enterprise. Survey work will be started as soon as entrance to this city can be obtained.

SALT LAKE CITY, UTAH.—The Interurban Construction Company of Maine has filed a copy of its articles and by-laws with the Secretary of State. The company is capitalized at $1,500,000 for the purpose of constructing a new interurban line between this city and Payson. E. A. Turner is president of the company and F. M. Orem, treasurer.

PATERSON, N. J.—George Arnold, president of the Board of Trade, John J. Fitzgerald, William A. Arnold, J. T. Doremus, M. I. Fuld, and D. J. Lefkowitz, of this city, have been negotiating with Edward W. Hine, of the Public Service Corporation, relative to an extension of the trolley branch of the corporation from Montclair to this city through the Notch Road.

GAINESVILLE, TEX.—The City Council has granted a franchise to J. T. Mackmiller and associates of Chicago, to build an interurban railway in this city. The line will run from Gainesville to Sherman and Dallas. A

deposit of $1,000 is to be made, guaranteeing that building operations will be begun within thirty days. The line is to be completed by July 6, 1913.

OAK BLUFFS, MASS.—The Oak Bluffs Street Railway Company plans to build a new carhouse and complete a 2,000-foot loop within a few weeks. It is in the market for a 500-horsepower condenser. W.

TEXAS CITY, TEX.—The Texas City Street Railway Company which has just been organized here with a capital stock of $60,000, will construct an interurban electric line between Texas City and Texas City Junction. It will also build a system of street railways in Texas City. The incorporators of the company are H. B. Moore, J. R. Goodson, F. N. Danforth, all of Texas City. D.

ST. LOUIS, MO.—An electric interurban system to connect St. Louis with Indianapolis, Ind., is being promoted by James D. Houseman, of this city. The new interurban is to be known as the St. Louis Belt, Illinois & Eastern Traction System. Articles of incorporation for the company have been filed and $600,000 is named as the capital stock. It is reported that ten miles of right of way have been secured in St. Louis County and 15 in Illinois.

RIVIERA, TEX.—The Riviera Beach & Western Railroad has been organized for the purpose of constructing an interurban line between Riviera Beach and Falfurrias *via* Riviera, a distance of 35 miles. The portion of the line between this place and Riviera Beach, 10 miles, is nearly finished and will soon be placed in operation. The incorporators of the company are Theodore F. Koch, Carl C. Henry, Samuel F. Lilligren, of Houston; Sam A. Robertson, of San Benito; P. H. Hanson, Robert Schwandt, of Chicago; Richard M. Kleberg, of Kingsville; and Marcos Phillips, of Riviera. The capital stock is $35,000. D.

OKLAHOMA CITY, OKLA.—Papers increasing the capital stock of the Muskogee Electric Traction Company from $300,000 to $500,000 have been filed with the Secretary of State. It is the intention to execute a mortgage on the property to the Equitable Trust Company of New York to secure $5,000,000 bonds for the purpose of making extensions and buying other lines. The Muskogee Traction Company has already purchased the Peoples Electric Railway Company of Muskogee, promoted by C. N. Haskell, building a line to Fort Gibson. It is also the intention to purchase the line that has been run to Sapulpa.

SAN BENITO, TEX.—At a recent meeting of the stockholders of the San Benito & Rio Grande Valley Railway Company held here a resolution was adopted authorizing the issuing of $10,000,000 of bonds for the purpose of constructing and equipping about 200 additional miles of the system. The proposed extension of the main line will run up the valley of the Rio Grande to Roma, about 75 miles, thence to the coal fields in Zapata County, an additional 35 miles. Several branch lines will be built. The passenger equipment of this system is gasoline motor cars. Sam A. Robertson of San Benito is president of the company, and is also at the head of the Rio Grande Construction Company, which has the contract for building the road.

FOREIGN TRADE OPPORTUNITIES.

(Parties interested in the following items should address the Bureau of Manufactures, Washington, D. C., and refer to the file number noted.)

NO. 9892. POWER-HOUSE EQUIPMENT.—Tenders are invited for the supply and erection of power-station equipment, comprising two 150-horsepower Diesel engines and accessories, two direct-coupled dynamos of 100-kilowatt output each, balancer, 60-brake-horsepower motor generator, switchboard, and engine room traveler, two 400-gallon oil tanks, etc. Sealed tenders, accompanied by a deposit of $973 and marked "Contract No. 17, tender for power-station equipment," will be received by the Town Clerk, Miramar, New Zealand, until December 16.

NO. 9906. TELEPHONE SYSTEM.—An American consul reports that a foreign telephone company, at a directors' meeting held recently, voted to install a new telephone system in its new modern station which is now being built. It was not decided whether the new system is to be similar to the present switchboard system, or to adopt the automatic, but bids will probably be asked for both. The consulate has applied for plans and specifications, and the company has promised to furnish these as soon as made out, when same will be loaned to interested firms by the Bureau of Foreign and Domestic Commerce. In the meantime, it will be well for firms desiring to compete to communicate with the company at once. Correspondence may be in English.

PROPOSALS.

ELECTRIC LOCOMOTIVE.—Sealed proposals will be received by Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until December 10 for one electric locomotive to be delivered at the Navy Yard, Washington, as per Schedule 4967.

MOTOR DRIVES.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until December 10 for two motor drives for engine lathes to be delivered at the Navy Yard, Norfolk, Va., as per Schedule 4991.

ELECTRIC PASSENGER ELEVATOR.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until December 12 for the installation complete of an electric passenger elevator in the post office at Florence, Ala., in accordance with the drawing and specification, copies of which may be obtained from Supervising Architect.

DIRECT-CURRENT GENERATOR PANELS AND DISTRIBUTING BOARDS.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until December 10 for five direct-current generator panels and distributing boards to be delivered at the Navy Yard, Brooklyn, N. Y., as per Schedule 4990.

ELECTRICALLY OPERATED PUMPS.—Bids will be received until November 29 by W. H. Zimmerman Company, 903 First National Bank Building, Chicago, Ill., for furnishing and installing one electrically operated deep-well pump and one electrically operated centrifugal fire pump, including foundations, piping, etc. Bids received are to be opened at a meeting of the City Council, Earlville, Ill., December 2. Specifications may be obtained from W. H. Zimmerman Company.

ELECTRIC CONDUIT AND WIRING, INTERIOR LIGHTING FIXTURES, VACUUM CLEANING SYSTEM AND LIFT.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until January 6 for the electric conduit and wiring, interior lighting fixtures, vacuum cleaning system and lift for the subtreasury building at San Francisco, Cal. Drawings and specifications may be obtained from J. Milton Dyer, 825 Cuyahoga Building, Cleveland, O.; J. W. Roberts, 403 Post Office and Court House Building, San Francisco, Cal., or at the discretion of the Supervising Architect.

NEW INCORPORATIONS.

AUGUSTA, ME.—The Columbia Railway, Gas & Electric Securities Corporation has been incorporated under the laws of Maine with a capital stock of $300,000.

SEATTLE, WASH.—Pacific Coast Light, Power & Railway Company has been incorporated with a capital stock of $500,000 by Albert M. Robinson and I. N. Robinson.

KITTERY, ME.—Wegner Control System, Incorporated, has been granted a charter with a capital stock of $1,000,000 to manufacture and deal in electrical devices. A. H. Wegner is president of the company.

ABBOTSFORD, WIS.—Abbotsford Electric Company has been incorporated with a capital stock of $10,000. The incorporators are A. H. Baker, A. J. Young, F. A. Jackson, H. J. Campbell, F. B. Wing and J. A. Billings.

ELIZABETH, N. J.—The Wireless Electric Lamp Company has been incorporated with a capital stock of $50,000 to manufacture electric signs. James C. Sharpe, Frederick P. Hall and Charles A. Trimble are incorporators. A.

CLEVELAND, O.—The Edward R. Kirby Company has been incorporated with a capital stock of $10,000 to manufacture electrical appliances, etc. The incorporators are Richard H. Lee, W. J. Pattison, G. M. Gallegher, E. M. Holmgren and T. P. Cadie.

ROCHESTER, N. Y.—American Telephone Fire Alarm Company, Incorporated, has been granted a charter with a capital stock of $5,000,000 to deal in fire alarm apparatus, etc. The incorporators are William S. Haring and Fred H. Smith, Chicago, Ill.; and Davis G. Dee, Rochester, N. Y.

ALBANY, N. Y.—The Society for Electrical Development has been incorporated, having for its aim the establishment of co-operative relations among the different electrical interests in the United States, Canada and Mexico, with a view to increasing the use of electric current by the public.

NEW YORK, N. Y.—M. B. Carson, Incorporated, has been granted a charter with a capital stock of $1,500 to engage in an electrical contracting business. The incorporators are Matthew B. Carson, Jamaica, N. Y.; William M. Williams, High Bridge, N. J.; and Arthur Terry, Short Hills, N. J.

FINANCIAL NOTES.

The continuing improvement in the diplomatic situation, arising from the trouble in the Balkans, has improved the foreign market, but on this side, as has been the case for the last two or three weeks, the situation has been backward. The positive statement by President-elect Wilson that an extra session of Congress would be convened in April has provoked some uneasiness in speculative circles.

The transfer of the Toledo Railways & Light Company to the management of H. L. Doherty & Company, New York, was accomplished on November 11. The Utilities Improvement Company, formed by the Doherty interests, will take charge of the property on January 1 next.

The Wooster Electric Company, Wooster, O., has elected officers as follows: President, Curtis V. Hard; vice-president, Dudley J. Hard; secretary-treasurer, Clarence L. Allis.

At the meeting of directors of the Chicago Railways Company for organization, Henry Blair was re-elected chairman of the board, John M. Roach was elected president; Seymour Morris, vice-president; Markham B. Orde, treasurer; Frank L. Hupp, secretary, and Williston Fish, general manager. Messrs. Blair, Roach and Morris were selected as members of the executive committee.

It is understood that a merger of the Vermont Power & Light Company, the consolidated Lighting Company and the Barre & Montpelier Traction Company is being arranged. The new company, it is said, is to have a capital of $2,000,000 equally divided between preferred and common. It is planned to take over the $1,325,000 bonds outstanding against the present companies.

The board of governors of the New York Stock Exchange approved applications to list the following securities: Virginia Railway & Power Company—$1,000,000 first and refunding-mortgage five-per-cent bonds, due 1934, making the total amount listed $11,003,000. New York Telephone Company—$5,000,000 first and general-mortgage thirty-year 4.5-per-cent sinking-fund bonds, making the total amounts listed $37,500,000 and £7,500,000.

It is reported that an Eastern banking syndicate has secured and exercised an option at $125 a share on the majority stockholdings of the New York Central & Hudson River Railroad Company in the Mohawk Valley Company. The New York Central owns $5,114,300 of the $7,500,000 Mohawk Valley stock. The Mohawk Valley controls the Rochester Railway & Light Company and several other public utility concerns in that section of New York. It is understood that the same terms will be offered to the minority holders of the stock as for control. These holders came in on the organization of Mohawk Valley, paying ninety-eight for their stock.

The Western Telephone & Telegraph Company has been formally dissolved under decree of court, and the property of the company has been sold to American Telephone & Telegraph Company, which assumes all its obligations. The American company has been substituted as party of the first part under indenture dated January 25, 1902, securing collateral-trust five-per-cent gold bonds of the Western Company. The Old Colony Company, trustee, under said indenture, is now prepared to receive such bonds for the purpose of having printed upon them the agreement of the American company to pay principal and interest thereof, and agreement of holder to accept said agreement of American Company, in lieu of that of Western company.

The Texas Light & Power Company of Dallas, which has just purchased the El Paso Gas & Electric Company, will extend the lighting system and enlarge the plant. This company has mortgaged its property to the Bankers' Trust Company of New York as trustee for $30,000,000 to allow the issuance of such bonds as may be necessary for the extensions and improvements to be made to the large number of electrical plants which it has recently purchased in different towns in Texas. Mr. Strickland says that the erection of one central power plant at Waco is already under way, as well as the construction of a steel tower, main transmission line from Waco to Fort Worth and Dallas, with branches proposed to Corsicana and other cities. The company proposes to begin soon the erection of another power plant at some point on the Red River.

With October the Western Electric Company completed the tenth month of its year, and shows a gain in goods billed of approximately five per cent over the same period in 1911. Indications are that the year as a whole will show a total of goods billed of slightly in excess of the estimate of $67,000,000 made early in the year. Last year the business done totaled $66,000,000, or within $3,000,000 of the company's largest year, so that this year will show only about $2,000,000 under the record year. There are a few localities, some in the East, but more in the West, where the company's business is not quite as good as it was a year ago. During October the incoming business was not as large as the billing, which somewhat reduced the orders on hand. The Western Electric Company still has about 22,000 employees on its payrolls. Officers of the company state that they expect the business of the remaining two months of the fiscal and calendar year to run along the same lines of the last two months and do not expect any notable increases.

Announcement is made that the Butte Electric & Power Company and its affiliated corporations owning reservoirs and operating plants on the Jefferson, Madison, Missouri and Yellowstone Rivers are to be consolidated as the Montana Power Company. The Montana Power Company will be controlled by the same interests which have heretofore directed the Butte Electric & Power Company, and the Great Falls Power Company, namely, John D. Ryan, John G. Morony, Max Hebgen, C. F. Kelley and Marcus Daly of Montana; C. W. Wetmore, C. H. Sabin, C. A. Coffin, S. Z. Mitchell, Seligman & Co. of New York; Gardner M. Lane of Boston; J. G. Schmidlapp of Cincinnati; Robert Fleming, Son & McLeod of London, England. C. W. Wetmore will be president and Max Hebgen of Butte, vice-president and general manager. It is asserted that the Montana Power Company contemplates the early expenditure of from $12,000,000 to $15,000,000. The capital will be made ample enough to provide for the financing of these amounts for future appropriations, and for the eventual retirement of the bonded debt of underlying companies.

The Electric Investment Corporation has been organized under the laws of Virginia with an authorized capital of $1,000,000 common stock and $500,000 preferred stock for the purpose of acquiring and dealing in securities, especially those of public utility corporations. The preferred stock of the company is seven-per-cent cumulative and three-per-cent non-cumulative, which provides for ten per cent on the preferred before the common stock receives a distribution. Officers of the company are: George A. Galliver, president; E. P. Chalfant, vice-president; A. Keshishiam, treasurer. The directors are the officers and R. E. Breed, president American Gas & Electric; Anson W. Burchard, of the General Electric Company; Alfred Gregory, of Hawkins, Delafield & Longfellow; W. L. McKee, of the Central States Electric Corporation; Oren Root, president Republic Railway & Light Company, and Harrison Williams.

Spencer Trask & Company and the Guaranty Trust Company of New York are offering at 94.5 to yield about 5.75 percent, $4,481,000 Central States Electric Corporation ten-year five-per-cent notes, of which a very large proportion has already been sold. The notes are secured by the deposit of the Cleveland Electric Illuminating Company common stock, which has received uninterrupted dividends since 1902, the present rate of eight per cent having been paid since 1904. They are followed by $3,734,700 seven-per-cent preferred and $4,481,600 common stock. It is expected that the later issues will be further increased with the continued growth and expansion of the corporation.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Nov. 18.	Nov. 11.
American Tel. & Tel. (New York)	142¾	143
Commonwealth Edison (Chicago)	144	144
Edison Electric Illuminating (Boston)	280	280
Electric Company of America (Philadelphia)	*12¼	12¼
Electric Storage Battery common (Philadelphia)	54¾	56¼
Electric Storage Battery preferred (Philadelphia)	54¾	56¼
General Electric (New York)	181¾	181¾
Kings County Electric (New York)	129	129
Manhattan Transit (New York)	1½	1½
Massachusetts Electric common (Boston)	18½	18
Massachusetts Electric preferred stamped (Boston)	77	77
National Carbon common (Chicago)	126	126
National Carbon preferred (Chicago)	118½	118½
New England Telephone (Boston)	153	155
Philadelphia Electric (Philadelphia)	23⅞	24⅛
Postal Telegraph and Cables common (New York)	84	86¼
Postal Telegraph and Cables preferred (New York)	67½	68
Western Union (New York)	78	78⅜
Westinghouse common (New York)	81	82
Westinghouse preferred (New York)	122	122

*Last price quoted.

Dividends.

The American Railways Company; the regular quarterly dividend of 1.5 per cent on the common stock, payable December 16 to stock of record November 29.

American Telegraph & Cable Company; a quarterly dividend of 1.25 per cent, payable December 1.

Chicago Elevated; the regular quarterly dividend of 1.5 per cent on preferred participating shares, payable December 1 to stock of record November 20.

Citizens' Traction Company; a semi-annual dividend of three per cent, payable November 16 to stock of record November 11.

General Electric Company; the regular quarterly dividend of two per cent, payable January 15 to stock of record November 30.

Philadelphia Electric Company; a quarterly dividend of 1.5 per cent, payable December 14 to stock of record November 21.

St. Joseph Railway Light, Heat & Power Company; a quarterly dividend of 0.5 per cent upon the common stock, payable December 2 to stock of record November 15.

Tennessee Railway, Light & Power Company; a quarterly dividend of 1.5 per cent, payable December 2 to stock of record November 16.

Washington Railway & Electric Company; a quarterly common dividend of 1 per cent, and a preferred dividend of 1.25 per cent; both payable December 1 to stock of record November 16.

Reports of Earnings.

WEST PENN TRACTION.

The West Penn Traction & Water Power Company, a subsidiary of the American Water Works & Guarantee Company, operating traction, electric light and power and gas and water companies in Pennsylvania, shows an increase of almost $800,000 in gross earnings for the year ended September 30, 1912, over the preceding year. Earnings of the company for the year ended September 30, 1912, show as follows:

	1912.	1911.
Gross earnings	$2,899,521	$2,107,215
Operation and taxes	1,535,996	1,054,953
Net earnings	1,363,524	1,052,262
Fixed charges	900,073	740,324
Balance	463,451	311,938

BANGOR RAILWAY & ELECTRIC.

Bangor (Me.) Railway & Electric for September, 1912 and the three months ended September 30, 1912 reports as follows:

	1912.	1911.	Changes.
Sept. gross	$ 66,175	$ 57,994	Inc. $ 8,181
Sept. net	39,901	35,109	Inc. 4,792
Sept. surplus	23,281	21,950	Inc. 1,331
3 months' gross	200,892	173,719	Inc. 27,173
3 months' net	117,016	99,951	Inc. 17,065
3 mos. surplus	67,280	60,716	Inc. 6,564

OREGON ELECTRIC RAILWAY.

The Oregon Electric Railway Company reports earnings for the year ended June 30, 1912, as follows:

	1912.	1911.
Gross revenue	$787,476	$616,079
Net revenue	306,942	292,567
Net income	263,780	267,404
Surplus	147,297	167,404

All of the common stock of Oregon Electric is owned by the Spokane, Portland & Seattle Ry., which is jointly controlled by the Northern Pacific and Great Northern. It operates about 135 miles of electric line in the Portland district, of which sixty miles between Salem and Albany have just been placed in operation.

SOUTHERN CALIFORNIA EDISON.

Southern California Edison for September, 1912, and the nine months ended September 30, 1912, shows good increases in gross earnings for both periods, but for the month there is a decrease in net earnings and surplus. This comes from an increase of $70,000 in operating expenses, due to the fact that the Long Beach power house is not yet in operation. The same fact caused an increase of $409,000 in operating expenses for the nine months, which cut down materially the net and surplus earnings for that period as well. Pending the completion of the new power house there is a large extra cost for fuel used in the temporary power plants. The surplus earned for the nine months was at the rate of 12.6 per cent a year on the $8,400,000 of common stock outstanding. The earnings statement for September, 1912, and the nine months ended September 30, 1912, follows:

	1912.	1911.	Changes.
September gross	$ 381,396	$ 339,841	Inc. $ 41,555
September net	151,265	172,734	Dec. 28,469
September balance	91,193	125,067	Dec. 33,874
September preferred dividends	16,667	16,667	.....
September surplus	74,526	108,400	Dec. 33,874
Nine months' gross	3,231,360	2,729,674	Inc. 501,686
Nine months' net	1,486,410	1,394,586	Inc. 91,824
Nine months' balance	949,343	896,916	Inc. 52,427
Nine months' preferred dividends	150,000	150,000	.....
Nine months' surplus	799,342	746,915	Inc. 52,427

VIRGINIA RAILWAY & POWER COMPANY.

The Virginia Railway & Power Company and allied companies income account for the year ended June 30, 1912, as reported to the New York Stock Exchange, follows:

Gross earnings	$4,558,193
Operating expenses (including appreciation)	2,422,903
Net earnings	2,135,290
Other income	69,158
Total income	2,204,448
Interest, taxes, sinking fund contributions, etc	1,423,201
Surplus	781,247
Preferred and common dividends	623,949
Sale of investments and adjustments	51,478
Surplus for year	105,820
Previous surplus	795,222
Surplus of Norfolk & Portsmouth Traction Co., June 30, 1911	23,265
Profit and loss surplus June 30, 1912	924,307

E. W. CLARK & COMPANY CONCERNS.

Companies managed by E. W. Clark & Company, Philadelphia, report earnings for September 1912, and the nine months ended September 30, 1912 as follows:

ST. JOSEPH (MO.) RAILWAY, LIGHT, HEAT & POWER.

	1912.	1911.
September gross	$ 95,875	$ 96,209
September net	39,004	30,701
September surplus	19,294	11,320
Nine months' gross	864,225	811,865
Nine months' net	363,635	301,571
Nine months' surplus	186,626	128,096

GRAND RAPIDS (MICH.) RAILWAY CO.

September gross	$109,952	$107,168
September net	51,143	51,671
September surplus	36,390	36,664
Nine months' gross	924,265	872,874
Nine months' net	407,239	380,089
Nine months' surplus	275,445	244,728

CONSUMERS POWER CO. OF MICHIGAN.

September gross	$ 226,365	$ 194,614
September net	100,312	88,430
September surplus	47,921	44,936
Nine months' gross	1,972,849	1,682,881
Nine months' net	889,533	795,464
Nine months' surplus	429,419	440,944

CHATTANOOGA (TENN.) RAILWAY & LIGHT CO.

September gross	$ 94,808	$ 83,116
September net	38,543	34,157
September surplus	15,947	14,028
Nine months' gross	782,346	697,236
Nine months' net	316,784	290,480
Nine months' surplus	119,995	112,547

Of the above companies Chattanooga Railway & Light is a subsidiary property of Tennessee Railway, Light & Power, while Grand Rapids Railway and Consumers Power of Michigan are subsidiary properties of Commonwealth Power, Railway & Light.

KEYSTONE TELEPHONE.

The report of the Keystone Telephone Company for the ten months ended October 31, 1912, shows a net surplus of $247,144, against $238,947 for the corresponding period in 1911. The income statement for October and ten months compares as follows:

October—	1912.	1911.
Gross	$ 103,798	$ 97,724
Net after taxes	51,150	48,542
Surplus after charges	25,894	23,588
Ten Months—		
Gross	$1,005,616	$969,639
Net after taxes	498,699	484,651
Surplus after charges	247,144	238,947

STONE & WEBSTER COMPANIES.

The Lowell (Mass.) Electric Light Corporation, the Edison Electric Illuminating Company of Brockton, Mass., and the Baton Rouge (La.) Electric Company, all managed by Stone & Webster, report as follows for September, 1912, and the twelve months ended September 30, 1912:

BATON ROUGE ELECTRIC.

	1912.	1911.
September gross	$ 11,432	$ 10,074
September net	4,195	3,237
September balance	2,462	1,508
Twelve months' gross	140,941	116,070
Twelve months' net	56,214	41,552
Twelve months' balance	35,452	20,877

Construction charges during month of September were $989, while for the twelve months ended September 30, 1912, construction charges were $10,268.

EDISON ELECTRIC ILLUMINATING.

	1912.	1911.
September gross	$ 32,550	$ 30,102
September net	10,346	8,882
September balance	8,405	7,054
Twelve months' gross	380,856	345,532
Twelve months' net	141,057	115,500
Twelve months' balance	117,703	93,925

Construction charges during month of September, 1912, were $6,523, while for twelve months ended September 30, 1912, these charges were $82,590.

LOWELL ELECTRIC LIGHT.

	1912.	1911.
September gross	$ 33,510	$ 31,007
September net	12,073	10,712
September balance	10,399	9,232
Twelve months' gross	409,278	431,573
Twelve months' net	147,137	153,048
Twelve months' balance	128,284	134,226

Construction charges for September, 1912, were $4,046, while for twelve months ended September 30, 1912, construction charges were $77,193.

EAST ST. LOUIS & SUBURBAN.

East St. Louis (Ill.) & Suburban reports earnings for September, 1912, and the nine months ended September 30, 1912, as follows:

	1912.	1911.
September gross	$ 217,962	$ 197,030
September net	101,068	85,588
September surplus	52,513	39,211
Nine months' gross	1,773,135	1,677,850
Nine months' net	772,158	718,719
Nine months' surplus	338,481	308,584

PERSONAL MENTION.

HENRY C. CUMMINS has been made manager of the Consumers Power Company at Stillwater, Minn.

SAMUEL KAHN has been appointed assistant to Elmer Dover in the operation of the western properties of H. M. Byllesby & Company. He was formerly in the operating department of the Chicago office.

A. E. FLOWERS, formerly professor in the University of Missouri, who has spent the last year studying at Cornell University, has been appointed to the Electrical Engineering Department of the Ohio State University.

HENRY L. DOHERTY, who has been, for several weeks, in London on business connected with the organization of the Utilities Improvement Company, has returned to New York.

HAROLD B. SMITH, director of the department of electrical engineering of the Worcester Polytechnic Institute, who is on leave of absence and who has recently returned from a trip around the world, was in Worcester recently and delivered three illustrated lectures descriptive of his travels. The first was before the Alumni Association, the second before the Worcester Polytechnic Institute Branch of the American Institute of Electrical Engineers and the third for members of the electrical engineering department and their friends.

GLENN C. WEBSTER, who for almost three years has been connected with the National Electric Lamp Association, Cleveland, O., in the official capacity of manager of the engineering department, has recently been chosen as general manager to supervise the activities of the Tungstolier Works of General Electric Company, Conneaut, O. Mr. Webster enjoys a wide reputation as an organizer. On several occasions he has expressed his very clearly defined and practical views on the subject of co-operation before business men's clubs in various parts of the United States. While in Cleveland Mr. Webster was an active worker in

Glenn C. Webster.

the Advertising Club and the Electrical League of that city. Those who are acquainted with his eminently successful career as a business executor in Cleveland and in the city of Warren, O., where he was located previously, feel confident that in his new sphere of activities a bright future is assured. His many friends join in wishing him every success in his latest undertaking. Mr. Webster succeeds E. J. Kulas who has resigned to take up other work.

WALTER HOWARD JOHNSON completed his twenty-fifth year in the electric lighting industry on Thursday, November 7. He entered the service of the Edison Electric Light Company of Philadelphia when that company was formed in 1887 with William D. Marks as president and has been in the central-station business, in Philadelphia, during the consolidation of the various lighting companies, serving in various official capacities, and is now first vice-president of The Philadelphia Electric Company. A luncheon was tendered Mr. Johnson by 21 of his associates in The Philadelphia Electric Company. President Joseph B. McCall presided, and among those present were: W. C. L. Eglin, past-president of the National Electric Light Association, and A. J. DeCamp, who for many years served on the Executive Committee of that organization. A handsome loving cup was presented to Mr. Johnson by the guests at the luncheon. Many personal reminiscences were recounted by those present, relating to the early history of the Philadelphia central station. All of the men present were either officials or heads of departments of The Philadelphia Electric Company, and an interesting feature was the fact that all of these men had been in active service with The Philadelphia Electric Company or subsidiary companies for periods of twenty years and upwards.

Walter Howard Johnson.

FRED R. LUFKIN, formerly of the instructing staff in electrical engineering of the Massachusetts Institute of Technology, and late assistant superintendent of lighting and wires of Brookline, Mass., has recently joined the staff of Walter B. Snow, publicity engineer, Boston, Mass.

GEORGE S. REINOEHL, a former official of the old Pennsylvania Telephone Company, has been appointed division manager of the Harrisburg Division of the Bell Telephone, to succeed J. H. Crossman, who has been promoted to the position of general commercial superintendent of the Bell Telephone Company of Pennsylvania.

JOSEPH MILLER, superintendent and manager of the Fountain Telephone Company at Covington, Ind., has been appointed superintendent of the Covington Electric Light & Water Works Company. Mr. Miller will assume his new position January 1, when the plant is to be taken over by the city.

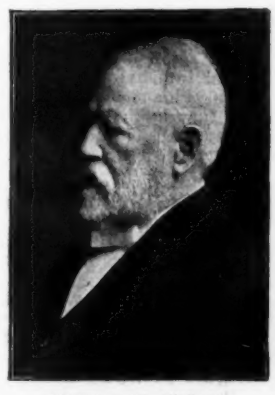
F. W. YENSON has been appointed general superintendent of traffic for the South Western Telephone Company, with headquarters at Dallas, Tex., succeeding H. T. McBride, assigned to special service.

JOHN J. CARTY, chief engineer of the American Telephone & Telegraph Company, New York City, has been made a member of the Order of the Sacred Treasure by the Emperor of Japan. The investiture with the insignia of the order and the presentation of a diploma for valuable service to Japan and her people have just taken place, the ceremony being conducted by Y. Numano, the consul-general. Mr. Carty already wears the decoration of the Order of the Rising Sun, conferred by the late Emperor after the close of the war between Japan and Russia.

T. D. CROCKER, commercial engineer of the Milwaukee Electric Railway & Light Company, has accepted a similar position with the Consumers Power Company, a Byllesby property, located in St. Paul. In addition to commercial-engineering work Mr. Crocker will have general supervision of the steam-heating end of the Consumers Power Company's business. Mr. Crocker has been connected with the Milwaukee Company for the past eight years, previous to that having been general superintendent of the Milwaukee Central Heating Company, which position he still held after the consolidation of the heating company with the electric company.

OBITUARY.

WILLIAM N. HOBART, president of The Triumph Electric Company, Cincinnati, O., passed peacefully away on the morning of November 15 in his seventy-sixth year. While Mr. Hobart has not taken a very active part in the management of the company for the past several years, his loss as a counselor and a friend will be none the less keenly felt. Mr. Hobart has always been an indefatigable worker, and during his exceptionally brilliant career has been identified with the directorate of several of the most prominent business houses in Cincinnati. He was a member of the executive committee and a director of the John Church Company, a director of the William S. Merrill Chemical Company, and past-president of The Chamber of Commerce and the National Wholesale



William N. Hobart.

Liquor Dealers' Association. For many years he was president of Maddux, Hobart & Company, a distilling house, which later became known as The Diamond Distilleries Company. In 1910 this business was sold to the Union Distilling Company, when Mr. Hobart retired from active management. In the promotion of music and art Mr. Hobart was very prominent, and for ten years or more was president of the May Festival Association.

WILLIAM ROTCH, JR., of Boston, Mass., died November 16 at the age of 36 years. Mr. Rotch was a graduate of the Lawrence Scientific School and had been connected with the electrical engineering department of the Bay State Street Railway Company.

D. D. ERWIN, one of the best known attorneys in Muskegon, Mich., died recently. Mr. Erwin was one of the organizers of the Grand Rapids-Muskegon Power Company and the Grand Rapids-Grand Haven and Muskegon interurban railway.

ARTHUR GALLAGHER, an electrician at the Bucyrus (O.) electric light plant, was instantly killed recently, when a plug from a gasoline engine in the plant blew out, causing an explosion. He was 27 years of age, and is survived by a wife and one son.

NEW PUBLICATIONS.

LIGHTING JOURNAL.—A new monthly publication, to be known as the *Lighting Journal*, has been projected and the first issue is promised for December of this year. Norman Macbeth is editor, and associated with him are: R. Leavenworth Elliott and Herbert E. Ives. The publication office will be at 50 Church Street, New York, N. Y. The field of the new journal will include commercial features, detailed descriptions of construction work, the design and application of fixtures, practical data regarding lamps, important technical investigations, current news and new apparatus. The aim will be to serve the practical progressive man.

EXPLOSION-PROOF MOTORS.—The Bureau of Mines has issued Bulletin No. 46, by H. H. Clark, entitled "An Investigation of Explosion-Froof Motors." Five motors were submitted by manufacturers for test, and the results are given in detail, along with a description of the method of protection employed. All of these motors depend upon relief valves, layers of gauze or metal plates, so constructed that the products of combustion produced by an explosion of gas inside the motor casing are sufficiently cooled during discharge to prevent the ignition of an explosive mixture of gas outside.

DATES AHEAD.

American Mining Congress. Fifteenth annual meeting. Spokane, Wash., November 25-28.

American Physical Society. Chicago, Ill., November 30.

American Society of Mechanical Engineers. Annual meeting, New York, N. Y., December 3-6.

American Institute of Chemical Engineers. Annual meeting, Detroit, Mich., December 4-6.

American Association for Advancement of Science and affiliated societies. Annual meeting, Cleveland, O., December 30-January 4, 1913.

Electrical Contractors' Association of New York State. Annual meeting, Syracuse, N. Y., January 21, 1913.

Western Association of Electrical Inspectors. Annual meeting, St. Louis, Mo., January 28-30, 1913.

National District Heating Association. Fifth annual convention, Indianapolis, Ind., May 27-29, 1913.

With the Electrical Manufacturers

Three States Cedar Company, Minneapolis, Minn., through its president, Louis C. Oleson, has purchased the interest of Carl H. Erickson, formerly secretary and treasurer of the company. Mr. Oleson is very optimistic regarding the cedar-pole business for the coming season.

Allis-Chalmers Company, through its representatives in the Pittsburgh-Cleveland district, states that business in the electrical industry is rapidly picking up. An evidence of this is found in the fact that in this territory alone the company closed contracts during the month of October aggregating 68,500 kilowatts.

Stromberg-Carlson Manufacturing Company, Rochester, N. Y., is sending out circular matter calling attention to its very complete line of construction materials and supplies. In this connection the company has issued new loose-leaf price lists for insertion in its construction catalog. A large supply of all this material is kept on hand and orders are promptly filled.

United States Electrical Manufacturing Company, Los Angeles, Cal., announced that it has just finished the installation of 50 three-phase induction motors in the new plant of the *Los Angeles Times*. All these motors are slow-speed machines; 35 of the number are of one-third horsepower in rating and operate at 750 revolutions per minute, being geared to linotype machines.

The Green Fuel Economizer Company, Matteawan, N. Y., has issued a booklet entitled "Best Proportions of Boiler and Economizer Service." This is a reprint of an article by George H. Gibson, which was printed in the *Iron Age*. It is well illustrated with diagrams, curve sheets and pictures of economizer installations. It gives many valuable data of interest to the boiler-plant engineer.

Pass & Seymour, Incorporated, Solvay, N. Y., has just issued Bulletin 750, which is a compact little folder devoted to the interchangeable features of Presto sockets. From 15 parts, 24 different sockets or receptacles may be made. This is strikingly shown by the unique arrangement of the inner pages of this folder. Copies of this publication can be obtained from the company upon request.

Rummler & Rummler, patent attorneys, have recently admitted as members of their firm, Rudow Rummler and Edwin Phelps, both of whom have had excellent training and experience in patent-law practice. The older members of the firm are: William R. and Eugene A. Rummler and Philip B. Woodworth. The law offices of the firm were recently removed from the fourteenth to the twelfth floor of the Tribune Building, Chicago.

The Platt Iron Works Company, Dayton, O., has issued a new catalog devoted to Platt centrifugal pumps. This publication (Bulletin No. 627-A) shows the wide range of this class of pumping machinery and gives many data that will be found of interest to pumping engineers. The pumps are described and illustrated both as to separate parts and assembled machines and installations. Many of these pumps are motor driven, although frequently steam-turbine drive is employed.

American Engine Company, Bound Brook, N. J., announces that it has secured an order for a 250-horsepower variable-speed American Ball engine from the St. Lawrence Pulp & Paper Company, Toronto, Canada. A 500-horsepower, four-cylinder, variable-speed engine has also been supplied to the De Grasse Paper Company, Pyrites, N. Y. These engines have been found very suitable for paper-mill drive and a large number of them are installed in the leading plants of this character throughout the country.

Federal Sign System (Electric), Chicago, Ill., has issued a folder devoted to the Federal porcelain lock-clamp bushings. Several types of these are shown in full size and there are also sketches that show the great variety of uses for which these bushings are adapted. Among the devices for which these bushings are used are outlet boxes, cutout boxes and metal cabinets, transformers, meters, switchboards and switch cabinets, junction boxes, window and theater reflectors, lighting fixtures, beams and other structural ironwork, etc.

The John R. McGowan Company, Cincinnati, O., has issued several new catalogs describing its various lines of pumping machinery. Catalog No. 29 is devoted especially to single-cylinder

steam pumps. This contains many valuable data of particular interest to the pumping engineer. Catalog No. 30 is a supplementary publication on single-cylinder pumps, giving many new designs in this line. Catalog No. 31 is devoted to duplex pumps, among which are also included high-pressure pumping engines and compound and triple-expansion engines. Catalog No. 34 describes deep-well pumping machinery and supplies for tubular wells.

Edwards & Company, 140th and Exterior Streets, New York, N. Y., have issued a booklet which describes and illustrates the Edwards vehicle-calling system. This is a combined electrical and mechanical device for calling carriages or automobiles to theaters, hotels, department stores, etc., and does away with the confusion that usually prevails when this service is left to the vocal efforts of the livery attendant. The Edwards system shows two, three or four figures that are easily legible both by day or night. The control is entirely electrical and is from a small switchboard in the vestibule. The publication describes the outfit in detail.

De Laval Steam Turbine Company, Trenton, N. J., has issued a 48-page bulletin describing De Laval steam turbines of the velocity-stage type. The principle of this method of construction is described in considerable detail. Among other topics discussed are the speed problem, methods of velocity staging for small turbines, practical considerations in the design and selection of small turbines. The construction of these turbines is described by the aid of many illustrations, showing details as well as complete machines. The turbines are built in sizes up to 600 horsepower and they are suitable for direct connection to centrifugal pumps and blowers and small alternating-current or direct-current generators.

The Waverley Company, Indianapolis, Ind., has issued what it calls the "Silent Waverley Year Book for 1913." This is an extremely attractive publication in which no pains have been spared to produce a high-class artistic book, insofar as the printer's, engraver's and binder's art permits. A panel cutout in the cover discloses the handsome interior of a Waverley limousine. Running through the book is a four-color half-tone frieze in delicate tints showing allegorical figures representing the seasons. Twelve pages are devoted to drawings of birds and branches, suggesting the twelve calendar months. There are also four separate season pages in brilliant color. Among the particularly novel designs of vehicle are the new Waverley limousine-four, the Georgian brougham and the Colonial brougham.

Record of Electrical Patents.

Issued by the United States Patent Office, November 12, 1912.

1,043,791. Lamp. W. F. Anklam, assignor to C. M. Hall Lamp Co., Detroit, Mich. An automobile headlight with parabolic reflector sleeved on the lamp socket.

1,043,797. Electric-Conduit Fitting. C. H. Bissell and C. B. Garling, assignors to Crouse-Hinds Co., Syracuse, N. Y. Includes support for a globe and a guard and lock therefor.

1,043,799. Motor-Control System. J. E. Brobst, assignor to General Electric Co. Provides for dynamic braking as the reversing switch is operated.

1,043,802. Fuse Attachment Plug. C. Carson, assignor to National Cash Register Co., Dayton, O. Includes inclosed fuses and a rotatable contact.

1,043,810. Jack. A. F. Dixon and W. E. Freeman, assignors to Western Electric Co., New York, N. Y. Is mounted on a bracket fastened to the pole and carries carbon line protectors.

1,043,811. Flash-Light Squib. N. Dowling, Philadelphia, Pa. The ignition-circuit terminals project through a block that holds a paper envelope containing flash powder.

1,043,818. Non-Interference Signal Box. G. L. Foote, assignor to Foote, Pierson & Co., New York, N. Y. A main-line magnet prevents the box from sending its signal while another box is signaling.

1,043,821. Electric Light. A. W. Gast, assignor to Chicago Miniature Lamp Works, Chicago, Ill. A sign-letter lamp has sectionalized filaments connected in series along the center lines of the letter.

1,043,823. Plug. D. D. Gordon, Chicago, Ill. Has a fixed central contact terminal and movable side terminals adapted to wedge inside the screw shell of the socket on a slight turn.

1,043,859. Electric Switch. J. W. Morway, Plainville, Conn. Relates to details of a rotary snap switch.

1,043,864. Electrically Heated Sad-iron. E. L. Pollard, Dobbs Ferry, N. Y., deceased, by M. M. Pollard, administratrix. One of two beads around the body engages the sides of the stand to raise the bottom of the iron above the bottom of the stand.

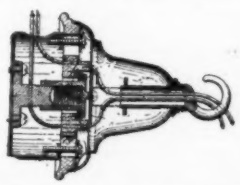
1,043,865. Telegraph Apparatus. E. Pope, Quebec, Que., Canada. Includes armature for adjusting a type plate relative to the platen.

1,043,872. Lamp. L. Schepmoes, Hasbrouck Heights, N. J., assignor to Safety Car Heating & Lighting Co. A car-deck lamp with reflector resiliently mounted in the casing about the lamp socket.

1,043,879. Trolley. E. A. Sullivan, assignor to Electric Railway Supplies, Ltd., Toronto, Canada. Relates to the harp construction.

1,043,881. Safety Appliance For Elevators. J. A. Thornhill, Champaign, Ill. Includes special safety circuit for the motor interconnected with the shaft door and car controller.

1,043,887. Dynamo-Electric Machine. J. B. Wiard, assignor to General Electric Co. The rotor core is made of bundles of laminae having annular and spoke portions.



1,044,035.—Fixture Insulating Base.

1,043,900. Electromagnetic Winding and Rewinding Mechanism. F. G. Brockett, Chicago, Ill. The take-up and rewinding rolls have electromagnetic clutches.

1,043,906. Pole-Changer. W. W. Dean, assignor to Dean Electric Co., Elyria, O. For operating a telephone ringing circuit from a battery.

1,043,907. Automatic Gate for Railway Crossings. N. E. Dell, assignor of one-third to Martin Jex & Co., Cobourg, Ont., Canada. An electric motor lowers and raises the gates according to train movements.

1,043,916. Insulator. F. M. Farwell, Kansas City, Mo. Has a diametric wire-receiving slot at the upper end of the base.

1,043,917. Electric Clock. C. Féry, Paris, France. An electromagnet gives periodic impulses to the balance wheel.

1,043,923. Strengthening Electric Alternating Currents. R. Goldschmidt, Darmstadt, Germany. Weak telephone currents are passed through a primary winding and a syntonized secondary is rotated above synchronism in its field.

1,043,937. Anode and Process of Manufacturing the Same. M. Huth, assignor to Siemens & Halske, A. G., Berlin, Germany. Consists of a block of manganese peroxide in which pieces of lead peroxide are imbedded.

1,043,942. No-Voltage Release Mechanism A. Kimble, assignor to Kimble Electric Co., Chicago, Ill. For the arm of a motor controller.

1,043,957. Electrically Operated Massaging Device. W. I. Miller, Cleveland, O. Contains an electric motor.

1,043,961. Trolley Wheel. G. F. Murch, New York, N. Y. Has roller bearings.

1,043,963. Soldering Iron. J. L. Nilsson, Chicago, Ill. Contains an electric heating element.

1,043,975. Fire-Alarm Signaling Apparatus. J. V. Shier, Sr., and J. La Vergne, Sr., Charleston, S. C. Is controlled by an auxiliary door in the box.

1,043,981. Illuminating Device. H. S. Strong, Mead, Wash. An electric display device, including a rotating shaft, commutator, brushes, disks and clamps.

1,043,994. Trolley-Wheel Guard. C. G. Wittmann and V. R. Wittmann, Independence, Mo. Has guard plates on each side of the wheel.

1,044,011. Portable Surface-Finisher. J. P. Buchanan, Newark, N. J. Is driven by an electric motor.

1,044,021. Electric Indicating Device for Signals. G. A. Clingwald, Edison, Cal., assignor of one-half to T. J. Rover. A remote indicator brush is moved synchronously with a local indicator brush.

1,044,035. Lamp-Fixture Insulating Base. L. Erikson, Malden, Mass. Relates to means for connecting the insulating base and canopy to the outlet box.

1,044,087. Electric-Furnace Condenser. T. P. Sharts, assignor of two-

thirds to M. M. Spaulding and W. E. Hall, North Adams, Mass. Has a water-jacketed vapor-conducting pipe.

1,044,088. Electric Furnace. T. P. Sharts, assignor of two-thirds to M. M. Spaulding and W. E. Hall, North Adams, Mass. Has a stationary electrode and a completely adjustable movable electrode.

1,044,098. Casing for Organ-Blowers. I. H. Spencer, assignor to Organ Power Co., Hartford, Conn. The lower part of the casing forms a support for the driving motor.

1,044,108. Conduit for High-Tension Electric Currents. W. A. Warren, Hurley, N. Y. In each coupling are insulating end blocks and springs for keeping the wires stretched in the air-insulated ducts.

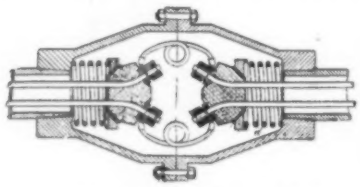
1,044,117. Telephone Receiver. C. Adams-Randall, Boston, Mass. Includes several sets of curved permanent magnets.

1,044,134. Electrical Fixture. R. D. Buchanan, Peoria, Ill. Combined adapter and hickey for mounting an electric fixture in a combination gas and electric outlet.

1,044,148. Trolley Base. C. O. Dawson and R. Gooding, Rochester, Mich. Has a hooked catch for holding the pole flat against the car roof.

1,044,151. Controlling Apparatus for Cab Stands. T. Drost, Hamburg, Germany. The insertion or withdrawal of checks at the local stands electrically actuates an indicating mechanism at a central office.

1,044,156. Cement for Metallic Filaments. K. Farkas, New York, N. Y., assignor of one-half to G. V. Williams. Composed of powdered tungsten oxides and aluminum, and a solution of sodium silicate.



1,044,108.—High-Tension Conduit.

1,044,158. Trolley Wheel. A. H. Fetzer, Galion, O. Has a roller bearing.

1,044,189. Cable Telegraphy. I. Kitsee, Philadelphia, Pa., assignor of one-half to W. J. Latta. The receiving apparatus includes three relays to change impulses of equal duration into separate characters.

1,044,192. Plug or Lamp Receptacle. H. F. Krantz, assignor to H. Krantz Manufacturing Co., Brooklyn, N. Y. The screw shell and protective casing are held to the back plate by a single screw.

1,044,201. Process of Preserving. J. C. Lincoln, assignor to Electric Meat Curing Co., Cleveland, O. Hams are cured in a preserving liquid through which alternating current is passed in the field of an electromagnet.

1,044,212. Controller Regulator. F. P. Maize, Portland, Ore. A pivoted lever and a ball lock the controller arm for a short period at each point of its "on" movement.

1,044,216. Clothes-Cleaning Device. K. Mayer, Nagy-Kanizsa, Austria-Hungary. An electric motor drives a shaft carrying a brush and suction fan connected to a suction head beneath the brush.

1,044,217. Squirrel-Cage Rotor. B. McCollum, Washington, D. C. The rotor bars contain iron sections adapted to become highly heated and rendered highly resisting by the starting currents.

1,044,218. Electrical Signal-Transmitter. J. McFell, Chicago, Ill. Includes a notched signal wheel and spacers for closing selective notches in the wheel.

1,044,223. Illuminating Sign for Automobiles. H. A. Moeller, Central Falls, R. I. An electric lamp has the automobile number across its front.

1,044,228. Safety Chest. L. Myers, Newark, N. J., assignor to Newell & Neal. Unlocking or moving the chest closes an internal electric alarm circuit.

1,044,229. Automatic Telephone System. E. Neuhold, assignor to Firma Deutsche Telephonwerke, G. M. B. H., Berlin, Germany. Relates principally to the control of the selector switches.

1,044,258. Film-Mending Machine. E. J. Schafer, Seaside, Ore. Includes an incandescent lamp to illuminate the interior of the film housing.

1,044,269. Electrical Heating Unit. C. A. Shaler, Waupun, Wis. Has three separate coils, one directly connected to the mains and two connected through thermostatic switches operating at different temperatures.

1,044,270. Electrical Heating Pad. C. A. Shaler, Waupun, Wis. Has resistance wire looped on each side of an intermediate sheet.

1,044,284. Heating Device. W. Stanley, assignor to General Electric Co. Includes an electric heating element, a heat-storage mass, a removable cover for the same to permit cooking vessels to be brought into contact therewith, and a thermal switch.

1,044,287. Means for Supporting Centrifugal Machines. H. W. Sturges, assignor to American Tool & Machine Co., Boston, Mass. Has an electric motor driving a vertical tubular shaft.

1,044,291. Electric Lighting. F. L. Temple, assignor to Bryant Electric Co., Bridgeport, Conn. A keyed socket with an auxiliary terminal connection to a remote switch.

1,044,293. Trolley Wheel. L. J. Tetlow, West Springfield, Mass. Has iron flanges and a brass running thread.

1,044,295. Process of Producing Silicon Carbide. F. J. Tone, Niagara Falls, N. Y. The charge is imbedded in a resistance core and current passed therethrough.

1,044,296. Method of Manufacturing Crystalline Alumina. F. J. Tone and T. B. Allen, assignors to Carborundum Co., Niagara Falls, N. Y. Fusion takes place in an electric furnace.

1,044,298. Trolley. A. Trible, Wilmerding, Pa., assignor of one-half to L. W. Vannear. A special framework for shifting the trolley pole.

1,044,338. Electric Drill. W. J. Bauroth, Columbus, O., assignor to Jeffrey Manufacturing Co. The motor shaft drives the drill stem at right angles to it through worm gearing.

1,044,348. Urethroscope. F. Cerbo, Providence, R. I. Has an electric lamp for illuminating the parts.

1,044,378. Revolving Contact Switch. E. J. Guay, assignor to General Electric Co. A spring-pressed contact on a biased arm makes wiping contact with a rotary contact finger.

1,044,399. Ignition System. S. L. Lebby, James Island, S. C. A combined storage battery and magneto system.

1,044,409. Power Installation. W. Morrison, Chicago, Ill. An automobile provided with gasoline engine, dynamotor and storage battery.

1,044,411. Signaling Apparatus. C. P. Nachod, Philadelphia, Pa. A semaphore with electromagnetic control.

1,044,423. Wall-Cleaner. R. Rosa, Louisville, Ky. An electric motor drives rotary cleaning brushes through a chain and sprocket.

Patents That Have Expired.

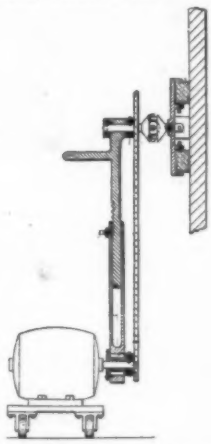
Following is a list of electrical patents (issued by the United States Patent Office) that expired November 19, 1912:

549,899. Plate for Storage Batteries and Process of Making It. F. J. Clamer, Philadelphia, Pa.

549,906. Automatic Electric Fire-Alarm. H. A. Edgecomb, Mechanic Falls, Me.

549,919. Electrical Indicator. J. W. Howell, Newark, N. J.

549,920. Underground Trolley System. C. E. Hubbs, Streator, Ill.



1,044,423.—Wall-Cleaner.

549,995. Underground Conduit. J. F. Cummings, Detroit, Mich.

550,018. Electrical Steering Gear. F. L. Dyer and L. H. Dyer, Washington, D. C.

550,039. Galvanic Battery. E. S. Boynton, Brooklyn, N. Y.

550,042. Electric Fan. P. Diehl, Elizabeth, N. J.

550,044. Rheostat for Use in Electric-Motor Circuits. R. Eickemeyer, Yonkers, N. Y.

550,057. Closed-Conduit Electric Railway. H. A. F. Petersen, Milwaukee, Wis.

550,132. Electric Appliance for Railways. H. A. F. Petersen, Milwaukee, Wis.

550,167. Electric Battery. T. Froggat, London, Eng.

550,192. Electric Protective Appliance. A. H. McCulloch, Boston, Mass.

550,204. Toll-Collecting Telephone Apparatus. G. K. Thompson, Malden, Mass.

550,205. Electric Time-Signaling Apparatus. J. T. A. Todd, Fort Worth, Tex.

550,210. Railway Signaling Apparatus. B. Wyckoff, Asbury Park, N. J.

550,215. Electric Arc Lamp. E. Cannevel, Paris, France.

550,220. Electric Car or Locomotive. R. Eickemeyer, Yonkers, N. Y.

550,229. Cycle Alarm. R. M. McDonald and A. McDonald, Dalmuir, Scotland.